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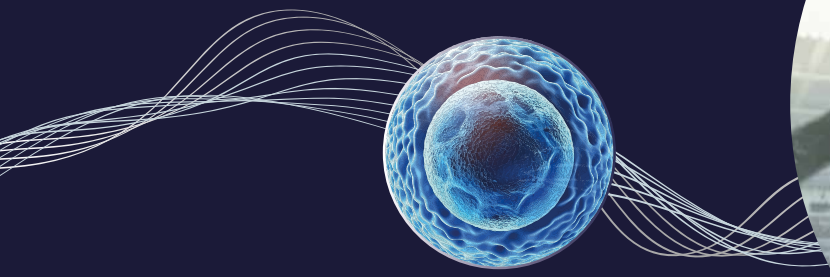

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Best regards yours thesportgroup-Team

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COVER
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PREHABILITATION OF THE ANTERIOR CRUCIATE LIGAMENT

The basis for an optimal postoperative outcome

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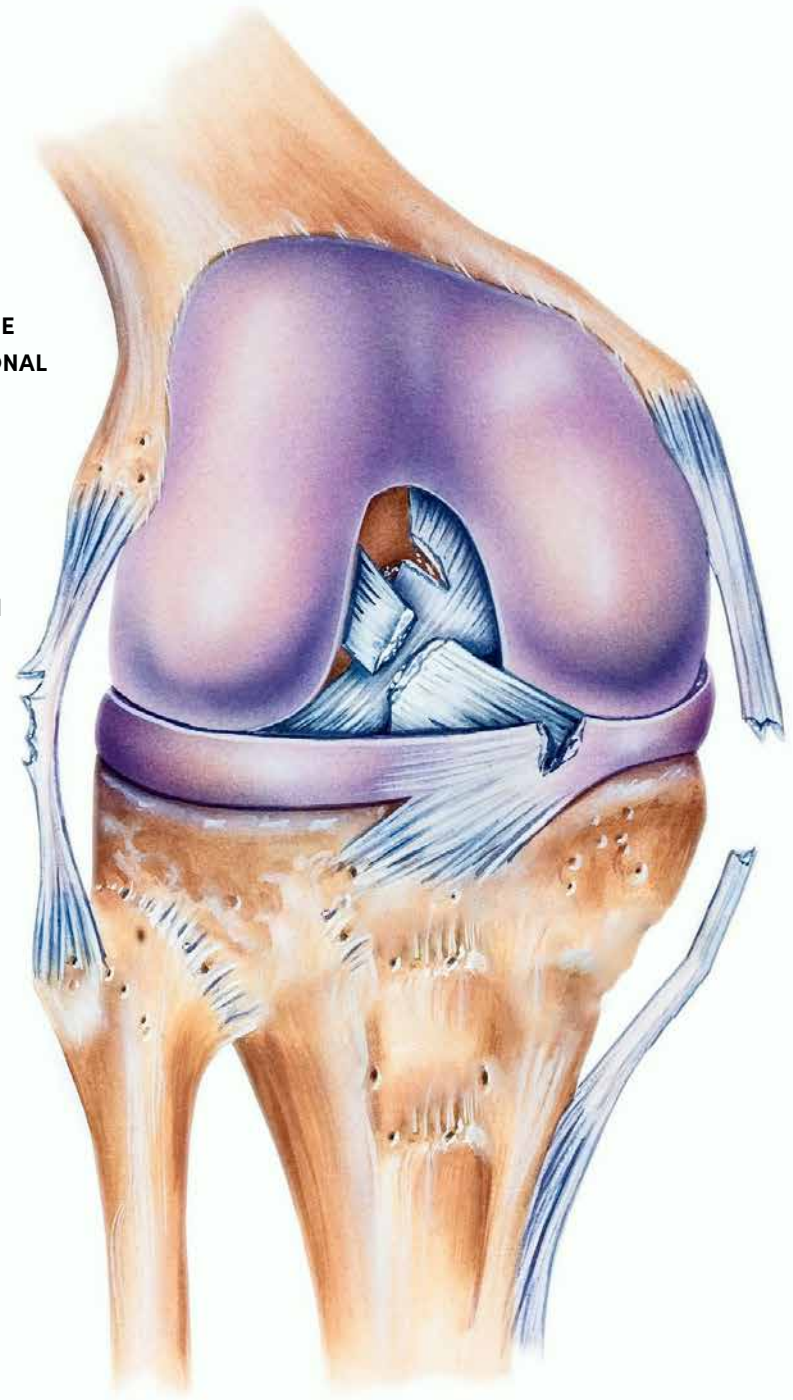


Prehabilitation is becoming increasingly important in the rehabilitation of orthopaedic injuries. It involves targeted physical, psychological and socio-medical preparation to promote rapid and full recovery. In addition to special training, it includes the optimisation of risk factors such as secondary diseases, nutrition, socio-medical planning and psychological preparation.

A frequently cited argument against prehabilitation is the delay in surgical treatment of a fresh ACL injury. However, studies show that delayed reconstruction, compared to early reconstruction, has no negative effects on secondary knee pathologies or self-assessed knee function after two years [8]. Instead, delaying the reconstruction allows for the identification of compensatory mechanisms and the targeted promotion of the patient's functional abilities preoperatively [9].

PHASES OF PREHABILITATION

Prehabilitation can be divided into two phases: Phase 1 aims to restore the knee to homeostasis by reducing inflammation, pain and swelling [7, 11]. After about two weeks, phase 2 begins, in which muscle strength and neuromuscular control are to be restored or maintained [11]. Training should include exercises

to strengthen the lower extremity, with a focus on knee joint extensors and flexors, neuromuscular training, stretching, and ROM exercises [3, 5]. Single-leg jumps and perturbation training can also be incorporated [10]. Although specific evidence-based guidelines for the early phase are lacking, protocols from Eitzen and Wilk provide orientation [5, 7, 11]. The intensity of the exercises depends on the patient's pretraumatic performance, training options, compliance and the condition of the knee. The literature recommends training 2 – 4 times a week for 75 – 120 minutes, including a 10 – 20 minute warm-up [4, 12–15].

PHASE 1: IMPROVEMENT RANGE OF MOTION, PAIN AND SWELLING REDUCTION

The most common complication after ACLR is loss of mobility, especially in full knee extension, leading to abnormal joint arthrokinematics and increased patellofemoral/tibiofemoral pressure [16 – 19]. To improve extension and flexion, passive and active ROM exercises with the help of elastic bands are helpful [15, 19]. Mobility exercises should be held for at least 30 seconds and performed several times a day. Wilk et al. recommend 60 minutes of daily stretching time at low intensity [7]. Immediately after the injury, the focus is on reducing swelling and pain [20]. Pain can inhibit muscle activity and impair quadriceps function. Preoperative cooling improves the postoperative pain situation in the short term and reduces the need for medication [21]. As part of the trend towards more outpatient treatment, cruciate ligament surgery requires a standardised procedure that also includes preoperative optimisation and pain management. Enhanced recovery programmes play a central role here.

PHASE 2: PROGRESSIVE STRENGTH TRAINING

Targeted exercises as part of prehabilitation can improve functional and muscular performance as well as lower limb symmetry index (LSI) six months postoperatively compared to patients without prehabilitation [1 – 3]. Studies also show positive effects on return to sport (RTS) and subjectively perceived knee function up to two years after reconstruction [4, 5]. Progressive strength training is a central component of prehabilitation. Eitzen et al. showed that preoperative quadriceps strength is a crucial predictor of knee function two years after ACL reconstruction, although preoperative deficits can persist in the long term [25]. In addition to maintaining the trunk and leg muscles, the focus is on improving muscular control. Patients who had undergone preoperative training showed less loss of extension strength postoperatively [15], while hamstring peak torque increased in both groups [14]. Both open- and closed-kinetic-chain exercises and concentric, eccentric, and isometric strength exercises are suitable. Open-chain exercises significantly improve quadriceps strength and are less problematic in terms of anterior translation than previously assumed [27, 28]. A progressive training programme, for example, involves 3 – 4 sets of 6 – 8 repetitions and a gradual increase in load according to the '+2' principle [4, 12, 25]. Alternatively, a weekly increase in load of 10–15 % can be applied [14].

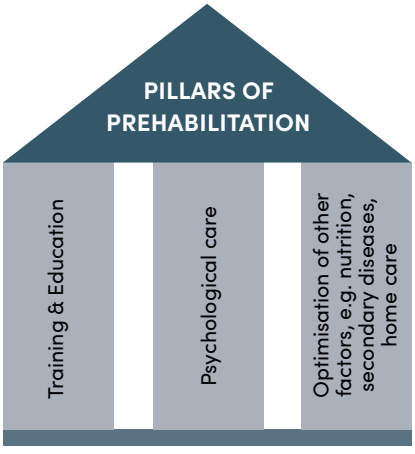
PLYOMETRICS, BALANCE AND PERTURBATION TRAINING

Single-leg jumping tests, in particular the Single Leg Hop for Distance (SDH), are reliable tools for assessing the rehabilitation process and knee joint stability in ACL injuries and after reconstructions [30].

The SDH combines leg strength and neuromuscular control and reflects the confidence of patients in the injured / operated knee. It also allows conclusions to be drawn about the resilience of sport-specific requirements and, in combination with quadriceps strength, has a predictive significance for recurrent ACL injuries [31]. Prehabilitation can improve SDH performance of the injured limb by 13.5 % compared to 9 % in a control group. At 12 weeks post-surgery, the prehabilitation group showed significantly less loss of performance in SDH [14]. In addition to the SDH, recommended exercises include stepper hops with a soft landing and controlled lateral jumps (3 – 5 repetitions) [11, 14, 15, 19].

Eitzen et al. recommend plyometric exercises that emphasise soft landings in the knee-over-toe position to avoid harmful stresses [11]. The Sideways Single-Leg Hop is recommended in 3 sets of 15 jumps, while the Stepper Hop can be incorporated as a single set of 15 repetitions [11]. Balance training can be incorporated early in prehabilitation. Studies have shown significant improvements in balance exercises, both with eyes open and closed, in the prehabilitation group [19]. This can include, for example, single-leg squats and standing on balance pads or boards [11, 19]. Standing on one leg is recommended for 30 seconds to 3 minutes with eyes open and 5 – 10 seconds with eyes closed. For single-leg squats on balance pads, 2 sets of 20 repetitions are suitable, depending on the quality of execution [11].

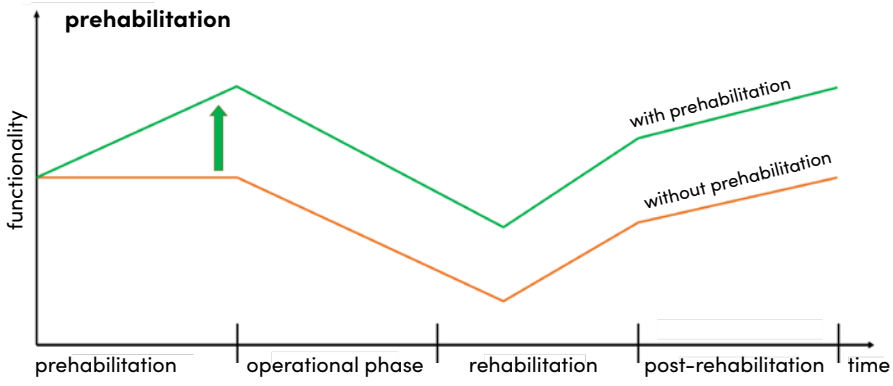
Perturbation training requires a largely restored control of the quadriceps and hamstring muscles and should be increased gradually over several weeks [11]. Patients who completed a prehabilitation programme consisting of neu-



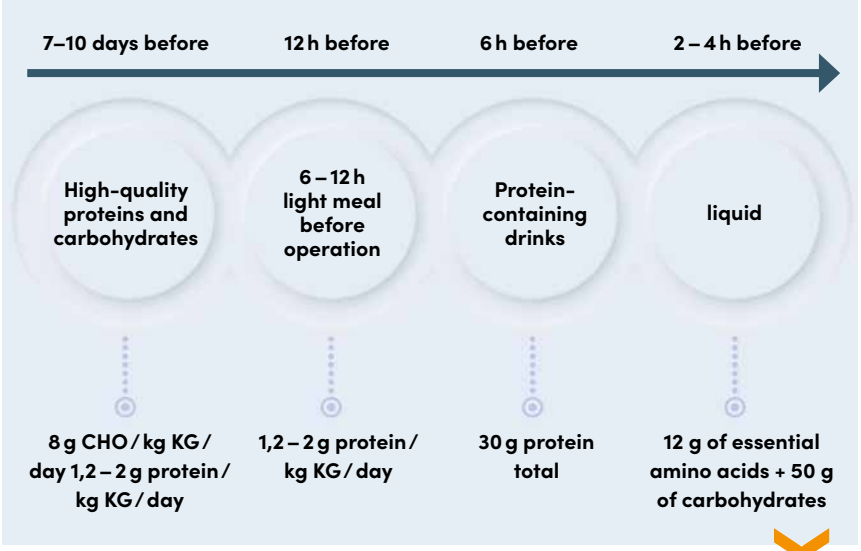
Pillars of prehabilitation before anterior cruciate ligament surgery

romuscular training, strength training and perturbation training showed better functional results and higher RTS rates than the control group two years after ACL reconstruction. In addition, the rate of giving-way events in ACL insufficiency was reduced [4, 11]. The training includes, among other things, single- and two-legged standing exercises on rolling or rocking boards in anterior-posterior or medial-lateral alignment. To increase the difficulty, diagonal movements, rotations, arm movements and self-initiated perturbations were integrated. In later phases, exercises with balls were added, such as throwing, catching or blocking [11, 19]. Neuromuscular training combines plyometric training, balance training and perturbation training. Studies show improvements in mobility and balance in training groups. Exercises should be performed at the end of the session to promote neuromuscular control under fatigue [7, 29].

Important: Despite the recommendations and guidelines given, prehabilitation training should always be adapted to the specific needs and abilities of each patient.



Molenaar, Charlotte JL, et al. "Prehabilitation, making patients fit for surgery–a new frontier in perioperative care. "Innovative surgical sciences 4.4 (2019): 132-138. © Dr. med. Robert Percy Marshall (adapted)



Example of preoperative nutrition

based on the Smith-Ryan et al. and Hirsch et al. [33, 34]. KG body weight, CHO carbohydrate.

ADDRESSING OTHER RISK FACTORS AS PART OF PREHABILITATION:

Nutrition

The nutritional status of the patient before and after surgery is a crucial factor for the outcome of musculoskeletal diseases. A high-protein, high-carbohydrate diet is recommended 7 – 10 days before surgery to promote wound healing, graft healing, and to prevent muscular atrophy [33, 34]. The increased caloric requirement due to the injury (20 % – 100 % more) requires a caloric balance, whereby both over- and undersupply must be avoided. A minimum intake of 2.0 g / kg body weight of amino acids (e.g., lysine, leucine, glutamine, arginine) is recommended [35]. Micronutrients such as zinc, boron, selenium and silicon play a central role in wound healing [34, 36]. In addition, creatine monohydrate, omega-3 fatty acids and vitamins C, D3 and E can be useful, as established in competitive sports [34, 37]. However, comprehensive RCT studies that clearly demonstrate their effectiveness are still lacking [39].

Sports psychology and education

Good physiological results after a sports injury do not always correlate with long-term satisfaction or quality of life [40]. Psychological processing plays an important role in regeneration after ACL injuries. Psychological factors that influence recovery should be identified as early as the prehabilitation phase [41]. Self-assessment is a central indicator of the physical and psychological state of the patient [12]. For physically active, mostly younger patients, an ACL injury often represents an unexpected burden, particularly due to high expectations of recovery and return to performance, especially in professional athletes. Many patients find it difficult to assess their actual leg axis stability and resilience, which often leads to over- or underestimation [43]. This insecurity, combined with the fear of re-injury and the pressure to return quickly, increases the psychological burden [41, 42, 44]. The data on educa-

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Oral communication at the Isokinetic Conference
Case reports – ACL injuries
(Chair: Prof. Werner Krutsch, MD) at Sunday, May 4, 10:30 (Noroeste-1)

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tion and compliance in prehabilitation for ACL injuries and their influence on the treatment outcome is limited. However, self-confidence, optimism and self-motivation certainly have a positive influence on the outcome and compliance and should be encouraged during prehabilitation [44]. Despite optimal training planning, psychological support, patient education and optimisation of the preoperative setting, external factors such as training opportunities, professional and family situation influence the outcome of an ACL injury and require special attention.

CONCLUSION

Prehabilitation after ACL injury lays the foundation for an optimal postoperative outcome. It includes not only basic measures and targeted training, but also the addressing of further risk factors such as education, psychological support, nutrition and pain management in order to create the best possible conditions for a successful operation and rehabilitation. The planning and implementation of prehabilitation must be individually coordinated with patients, therapists and cost units. In the future, the focus should be on creating structured, quality-assured concepts for prehabilitation in order to enable patients to prepare for the surgical and postoperative phase in an evidence-based and effective way.

This article is a highly abbreviated of the article published in 2023 Valle, C., Marshall, R. C., & Mengis, N. (2023). Prehabilitation for anterior cruciate ligament injuries. Knee Journal, 5(1), 3–11. https://doi.org/10.1007/s43205-022-00188-2

The bibliography can be found with the article at www.sportaerztezeitung.com

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NUTRITION AS A CENTRAL COMPONENT OF PREHABILITATION

Targeted nutrition in musculoskeletal pre- and rehabilitation has become increasingly important in recent years. In their current article 'Prehabilitation Of The Anterior Cruciate Ligament' (see pages 2 – 6), Valle / Marshall / Mengis emphasise that a patient's nutritional status before and after surgery has a decisive influence on the healing outcome of musculoskeletal diseases.

According to the authors, a protein- and carbohydrate-rich diet is recommended 7 – 10 days before surgery to promote wound healing, graft healing and maintenance of muscle mass [1, 2]. Furthermore, they address the increased calorie requirement and the minimum daily intake of amino acids [3] as well as the importance of micronutrients for wound healing [2, 4 – 5] and point out the lack of large randomised controlled trials (RCTs) to date that clearly demonstrate the effectiveness of these nutritional interventions [6].

INTEGRATION OF NUTRACEUTICALS IN MUSCULOSKELETAL REHABILITATION

The latest research results on the rehabilitation of anterior cruciate ligament injuries (ACL) show that certain bioactive substances in food can promote the healing process through anti-inflammatory effects, support tissue regeneration and improve joint health. A recent review highlights the following active ingredients in particular [7]:

CURCUMIN

Curcumin works by inhibiting post-traumatic inflammatory processes, activating stem cells and regulating collagen metabolism [8 – 10]. An interesting approach is the combination with nanotechnology as curcumin nanoparticles, which, for example, could improve the bioavailability in the tissue and thus achieve a higher effect, but this form of application is not yet widely used and investigated [7]. In the case of acute injuries or operations, however, the optimal timing of therapy must be discussed on the basis of the physiological inflammatory response. For further information, see [11].

OMEGA-3 FATTY ACIDS

Omega-3 fatty acids, in particular eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), help to reduce inflammatory processes and promote tissue regeneration by reducing pro-inflammatory cytokines and inducing anti-inflammatory molecules (known as resolvins) [12]. In addition, omega-3 fatty acids influence gene expression by affecting inflammatory transcription factors [13]. Clinical studies have already shown positive effects on muscular regeneration [14]; however, the optimal timing of therapy is controversial due to the physiological inflammatory response in the first few days after injury.

BROMELAIN

Bromelain is a proteolytic enzyme found in pineapples that has anti-inflammatory and decongestant properties. It also has immunomodulatory effects via the activation of macrophages, lymphocytes and natural killer cells [15]. Although the use of bromelain is relatively widespread in the context of injuries or surgery and has been relatively well researched in dentistry in particular [16], clinical data on its effects in the pre- and rehabilitation phases are lacking in the musculoskeletal field.

VITAMIN D

Low serum levels of 25-hydroxy-vitamin D are associated with an increased incidence of injuries (e.g. muscle injuries and stress fractures; [17, 18]), increased levels of pro-inflammatory cytokines [19] and biomarkers, as well as increased postoperative loss of strength [20]. Since vitamin D metabolism is extremely complex and many of the active processes only take place in the body over the longer term, the use of vitamin D derivatives is less important in the phase of acute injury and more so as a long-term supplement.

VITAMIN C AND ANTIOXIDANTS

Reactive oxygen species (ROS) are formed during metabolism and play a dual role: on the one hand, they can promote muscle breakdown, but on the other hand, they are essential for training adaptations. Antioxidants such as vitamin C or polyphenols neutralise excess ROS, but an excess of antioxidants can impair recovery because positive ROS-mediated adaptation processes would be inhibited [21, 22]. Instead of long-term supplementation with isolated antioxidant preparations (e. g. high-dose vitamin C), a balanced diet with antioxidant-rich foods such as fruit and vegetables is recommended as a preventive measure to optimally support regeneration after injuries [23]. In the case of highly acute inflammation, however, antioxidant preparations can be considered to slow down the excessive inflammatory response.

Editor's note: For more information on collagen, please refer to the work by Catalá-Lehnen / Groß / Kuhrau (Orthobiologics In Sports Medicine Collagen, sportärztezeitung 03/24) and the current article by Florido (Collagen, p. 38 of this issue).

CONCLUSION

The integration of nutraceuticals into musculoskeletal rehabilitation represents a forward-looking strategy. While preclinical and initial clinical studies are promising, further large-scale randomised studies are needed to validate the optimal dosage and long-term effects. Interdisciplinary collaboration between orthopaedists, nutritionists and sports scientists is crucial to integrate individual nutrition concepts into multimodal rehabilitation.

The bibliography can be found with the article at www.sportaerztezeitung.com

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PREHABILITATION AS BIOLOGICAL PREPARATION OF THE PATIENT

Influence of exercise and nutrition on orthobiologic regenerative therapies

When do regenerative therapies and sports medicine treatments begin? Not with the injection or the first shockwave, but with a coordinated, optimal physical, psychological and socio-medical preparation for medical interventions (see also the article by Valle / Marshall / Mengis, pp. 2 – 6 of this issue).

Particularly in the case of conservative regenerative procedures, especially with blood derivatives as orthobiologic therapy (PRP/ACP/ACS/BCS), also USGET Electrolysis, shock wave and viscosupplementation such as hyaluronic acid, targeted prehabilitation is of growing importance and can develop into a biological booster in the future, among other things through specific nutritional interventions and in combination with specific exercise 'immunology'. 'Prepare your patient – and their biology.' (see Frank / Kim / Nüssler / Jacon. Outcome of cancer surgery. Deutsches Ärzteblatt 37/2022). This precise and probably also synergistic connection will be part of the future of these regenerative therapies. Success with PRP does not happen in a vacuum – nutrition, metabolism, exercise, and the inflammatory situation must be understood and specifically targeted as a complex interaction.

At this point, we would like to briefly and concisely present three papers that have addressed this topic and show the potential that lies behind them. More on this will be available in the coming months in the sportärztezeitung, www.sportaerztezeitung.comas well as on our youtube-health-channel (https://www.youtube.com/@sportarztezeitung9333). You can also find out more at the Isokinetic Conference in Madrid at the lessons and workshops by Tobias Würfel, MD and Alberto Schek, MD.

1. RECOVERY AND THE IMMUNE SYSTEM (HAUNHORST ET AL.)

Physical activity leads to functional changes in the immune system, in particular through an acute shift in circulating immune cells (Psczolla et al., 2017). For example, NK cell cytotoxicity increases in a load-dependent manner, mainly due to an increased number of cytotoxic cells in the blood (Campbell & Turner, 2018b; Walsh et al., 2011). At the same time, there is a transient release of pro- (e.g. IL 1β, IL 6, TNF α) and anti-inflammatory cytokines (e.g. IL 1ra, IL 10) (Moldoveanu et al., 2000; Ulven et al., 2015). IL-6 in particular increases – depending on training intensity and muscle mass – sometimes by a factor of 100 (Pedersen & Fischer, 2007; Steensberg et al., 2002). Despite its classic role as a pro-inflammatory marker, IL-6 has also an anti-inflammatory effect in the context of exercise, as it is released myogenically and inhibits TNF-α release (Starkie et al., 2003).

https://www.taylorfrancis.com/chapters/edit/10.4324/9781003250647-8/recovery-immune-system-simon-haunhorst-wilhelm-bloch-christian-puta

2. NUTRITION AND PRP COMPOSITION (PLATZER ET AL.)

A comparable immunomodulatory influence is also shown by eating behaviour. This paper analyses the variability of PRP and identifies clinical factors that could influence the therapeutically important components. The results show that the concentrations of interleukin-6 (IL-6) in PRP from vegans are significantly lower than in omnivores, while the concentrations of IGF-1 and platelets show no significant differences. Furthermore, no influence of the time of blood collection on the analysed parameters was detected. These findings are important for generating sufficient evidence for the therapeutic use of PRP in orthopaedics and suggest that dietary behaviour plays a significant role in PRP composition. Diet is thus a potentially relevant variable for the composition of immunoactive blood products.

https://link.springer.com/article/10.1007/s00132-023-04442-x

3. OPTIMISATION OF ORTHOBIOLOGIC THERAPIES THROUGH EXERCISE, NUTRITION AND DIETARY SUPPLEMENTS (MONTAGNINO ET AL.)

Lifestyle factors and their modification, such as exercise, nutrition and certain supplements, have been shown to influence the quality of autologous blood products such as PRP and cell-based therapies. Intensive physical activity not only increases the platelet count, but also improves their adhesion and the release of regenerative growth factors. At the same time, low-inflammatory diets can increase platelet activity, while stress, high sugar consumption or hypercholesterolaemia promote inflammatory processes and negatively affect the quality of PRP. The function of mesenchymal stromal cells (MSC), for example with regard to senescence, replication and differentiation, also reacts sensitively to exercise, calorie restriction and micronutrients. The authors emphasise the biological plausibility of these relationships, call for further translational studies to quantify the effect and for a stronger integration of these findings into individualised therapeutic approaches.

https://doi.org/10.1002/pmrj.13320

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Editor's note:
Read an article about
PRP for knee osteoarthritis, Indications for use – consensus of the ESSKA-ICRS
Prof. Thomas Tischer, MD, MBA

STRESS, AUTONOMIC NERVOUS SYSTEM AND FASCIA

A Case Study in Sport Climbing

This integrative n-of-1 case study examined the relationship between daily stress, autonomic nervous system (ANS) activity, and the biomechanical properties of the thoracolumbar fascia (TLF) in a 50-year-old experienced sport climber over a 30-day training period.

Key Findings:

- Stress and Fascia: Emotional stress was associated with reduced deformability of the TLF, likely due to increased sympathetic nervous system activity. This could affect performance and raise injury risk.
- Sympathetic Activation: Two days after a stressful event, sympathetic activity increased and correlated with a significant drop in TLF gliding ability ($r = -0.50$ to -0.65; $p < 0.002$).
- Parasympathetic Compensation: Seven days post-stress, parasympathetic co-activation mediated a rebound in fascia mobility (90 % mediation; $p = 0.048$), interpreted as a form of supercompensation.
- Mechanisms: Sympathetic overactivity may increase tissue viscosity via interstitial fluid loss and reduced hyaluronan mobility. Parasympathetic activation may restore gliding by promoting fluid balance and reducing inflammation (e.g., lowering IL-6, TNF-α).

CONCLUSION

Stress impacts fascia mechanics via ANS modulation. These findings highlight the importance of considering psychophysiological factors in athletic performance and injury prevention, especially in high-demand sports like climbing.

Based on: Brandl A. et al. Relations between daily stressful events, exertion, heart rate variability, and thoracolumbar fascia deformability: a case report. J Med Case Reports. 2024;18:589.

Read more about it soon at www.sportaerztezeitung.com

NEW STRATEGIES IN INFLAMMATION THERAPY

Resolving inflammation with the help of natural products

PROF. OLIVER WERZ, MD /
CHAIR OF PHARMACEUTICAL MEDICAL CHEMISTRY AT THE INSTITUTE OF PHARMACY, FRIEDRICH SCHILLER UNIVERSITY, JENA

Muscle, ligament and tendon injuries are associated with an inflammatory process due to tissue damage, which manifests itself in the five cardinal symptoms of inflammation: pain, swelling, redness, warmth and loss of function. Acute inflammation is nevertheless a physiologically important process with the aim of repairing and regenerating the damaged tissue and restoring homeostasis [1].

GUM RESIN OF THE BOSWELLIA PLANT/ FRANKINCENSE TREE

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In contrast, chronic unresolved inflammation, even if only weakly expressed, is destructive and contributes to prominent diseases such as arthritis / arthrosis, asthma, Crohn's disease, Parkinson's disease and Alzheimer's disease, as well as atherosclerosis, diabetes and cancer [2]. It is therefore not surprising that anti-inflammatory corticoids and non-steroidal anti-rheumatics (NSAR) such as ibuprofen, aspirin or diclofenac are among the most frequently taken medications. However, their therapeutic efficacy is often unsatisfactory, especially with long-term use, and the side effects, such as immunosuppression, renal dysfunction and gastric ulcers, are severe and often cause discontinuation of the medication [3].

PROMOTING THE RESOLUTION OF INFLAMMATION AS A NEW THERAPEUTIC APPROACH

In order to develop alternative strategies for pharmacotherapy, basic research is endeavouring to gain a better understanding of the inflammatory process in its phases (i) development, (ii) progression, (iii) maintenance, (iv) inflammation resolution and (v) tissue repair and regeneration (Fig. 1). It has been recognised that, in contrast to conventional therapy with corticoids and NSAIDs, it is not the inhibition of inflammation but the promotion of inflammation resolution that could represent an attractive therapeutic option (Fig. 1) [4]. However, there are currently no approved drugs available for the latter. For a long time, it was thought that the resolution of inflammation was a passive process in which inflammatory messengers are eliminated. However, new findings from current research show that resolution is an actively controlled process in which messengers play a crucial role [5]. Inflammation resolution is therefore essential for a successful regeneration phase and thus important for the healing of tissue injuries. But how is this special resolution process regulated and which messenger substances and molecular mechanisms are involved?

LIPID MEDIATORS REGULATE ALL PHASES OF INFLAMMATION

Lipid mediators are endogenous messengers that are formed primarily in immunocompetent cells and endothelial cells from polyunsaturated fatty acids. They are involved in all phases of inflammation, i.e. in the development, progression, resolution and tissue regeneration [5, 6]. While the omega-6 fatty acid arachidonic acid is converted by cyclooxygenases and 5-lipoxygenase into pro-inflammatory prostaglandins (PG) and leukotrienes (so-called eicosanoids), specialised pro-resolving mediators (SPM) can be formed from omega-3 fatty acids such as eicosapentaenoic acid and docosahexaenoic acid by means of various lipoxygenases (Fig. 2). These SPM comprise a large family (currently 47 known) of inflammation-resolving lipid mediators, which are subdivided into lipoxins, resolvins, protectins and maresins and are mainly formed by 12 / 15-lipoxygenases. Interestingly, eicosanoids, which are massively produced right at the beginning of the inflammation, and SPM, which are formed later in the process (Fig. 1), usually have opposing effects in the inflammatory process:

Eicosanoids

- » induce inflammation, pain, fever and bronchoconstriction
- » increase vascular permeability
- » stimulate excessive phagocyte migration and activation
- » induce the release of oxygen radicals, proteases and cytokines

SPMs, on the other hand

- » promote the resolution of inflammation and reduce pain
- » inhibit massive phagocyte infiltration and the release of pro-inflammatory cytokines
- » stimulate phagocytosis and efferocytosis of apoptotic cells and cell debris
- » improve wound healing and tissue regeneration and are organ-protective

Despite their pro-inflammatory character, PG also have beneficial and important properties for homeostasis. These include, among other things, the regulation of platelet aggregation, broncho- and vasodilation, gastric protection, kidney and uterine function. Of particular interest are the contrasting effects of PGE2 in the inflammatory process.

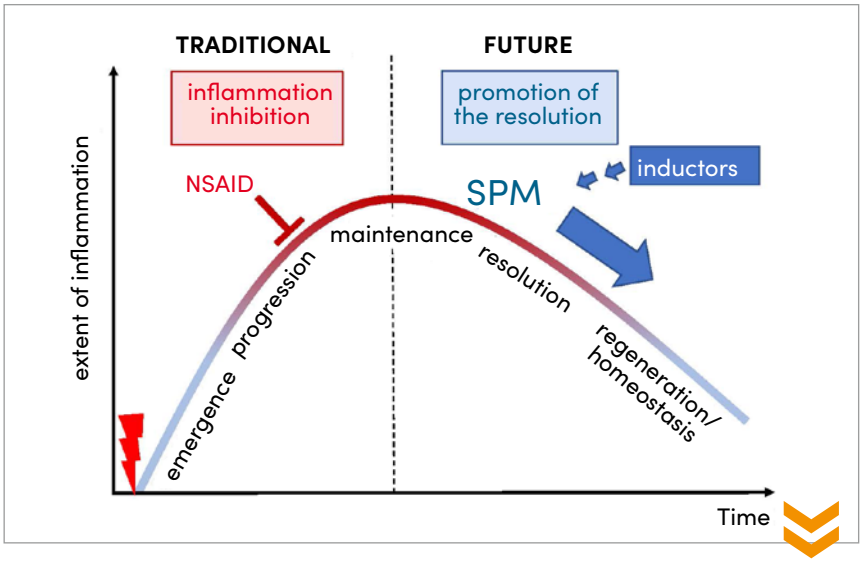

FIG. 1 Extent and temporal phases of the inflammatory process from the onset to the restoration of homeostasis. Traditional strategies (NSAIDs) inhibit inflammation, while future strategies (SPMs and SPM inducers) promote resolution and regeneration.

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Depending on (i) the expression pattern of the four PGE2 receptors in the target cells, (ii) the amount of PGE2, and (iii) the temporal course of the inflammation, PGE2 has a pro-inflammatory effect in high amounts in the early inflammatory phase, but in the late phase, at low concentrations, it has an anti-inflammatory effect and promotes SPM formation and resolution / tissue regeneration [7]; the homeostatic PGE2 effects (gastric protection, kidney function) are also mediated by low concentrations [8].

TRADITIONAL AND NEW STRATEGIES IN INFLAMMATION THERAPY

Traditional anti-inflammatory therapy with NSAIDs is based on the blockade of COX-1/2 and thus on the suppression of the entire PG formation (Fig. 2). In view of the many different effects of PGE2, the question arises: How does the inhibition of PGE2 biosynthesis by NSAIDs affect resolution/regeneration? Experimental and clinical studies show that NSAIDs such as ibuprofen, indomethacin or celecoxib actually inhibit the resolution of inflammation by, for example, promoting leukotriene formation and simultaneously inhibiting SPM production [3, 9 – 11]. Thus, NSAIDs can have a negative effect on the healing of a tissue injury. But what alternatives to pharmacological inflammation intervention are there that do not inhibit resolution but instead specifically promote the resolution of inflammation? One approach currently being pursued is the direct application of SPM [12]. However, SPM are relatively unstable, their production in sufficient quantities is complex and expensive, and their targeted application is complicated. Another strategy to promote resolution through SPM consists of the supplementation of omega-3 fatty acids (DHA and EPA) and/or SPM precursors (18-HETE, 17-HDHA, 14-HDHA) to increase endogenous SPM formation. However, according to several clinical studies, this is not always successful; for example, SPM plasma levels are often unchanged after DHA/EPA supplementation [13].

New strategies are pursuing the manipulation of endogenous SPM formation by modulating the biosynthetic enzymes. The aim here is to use special active ingredients to favourably influence the shift in the formation of eicosanoids towards SPM (so-called 'lipid mediator class switch' [7]), which occurs during resolution (Fig. 2). This could be used to specifically accelerate the healing of an inflammatory disease without causing the side effects typical of NSAIDs [14]. Some substances have already been identified for this purpose. Interestingly, natural products and phytopharmaceuticals are particularly active, which has been demonstrated by elucidating the molecular mechanisms of action and by experimental studies. In contrast to the COX-blocking NSAIDs, the pharmacological principle consists of specifically inhibiting those enzymes in the lipid mediator metabolism that produce high amounts of eicosanoids in the acute phase in inflammatory cells, without affecting anti-inflammatory PG (esp. PGD2 and PGE2) in the late phase and also activating the SPM-producing enzymes [14]. Specifically, these are substances that ideally combine three molecular mechanisms of action: inhibition of (i) microsomal PGE2 synthase-1 (mPGES-1; PGE2) and (ii) 5-lipoxygenase (leukotrienes) and (iii) stimulation of 12 / 15-lipoxygenases (SPM) (Fig. 2). Since these enzymes all have fatty acids or oxygenated fatty acids as substrates and are partly regulated allosterically by these molecules, so-called fatty acid mimetics are suitable as 'multitarget modulators' [8].

NATURAL PRODUCTS TO PROMOTE THE RESOLUTION OF INFLAMMATION AND REGENERATION

Numerous clinical studies demonstrate the efficacy of natural product-based drugs in inflammatory diseases, as shown, for example, by a meta-analysis of six controlled studies with patients with knee osteoarthritis: an enzyme-flavonoid combination preparation (**Wobenzym**) was comparable to diclofenac in terms of efficacy, but with better tolerability and fewer side effects [15].

The most well-known natural substances for the dissolution of inflammation are boswellic acids (pentacyclic triterpene acids and thus fatty acid mimetics) from the resin of frankincense trees, which have been identified as multitarget modulators for promoting the 'lipid mediator class change' [16]. Frankincense resin extracts have been used in folk medicine for the treatment of inflammatory diseases for many years, and more than a dozen clinical studies have demonstrated their efficacy in osteoarthritis, rheumatoid arthritis, chronic inflammatory bowel disease and asthma [16]. For more than 30 years, these anti-inflammatory effects have been explained by the modulation of lipid mediator biosynthesis, although the exact molecular mechanisms have only recently been elucidated. It has recently been

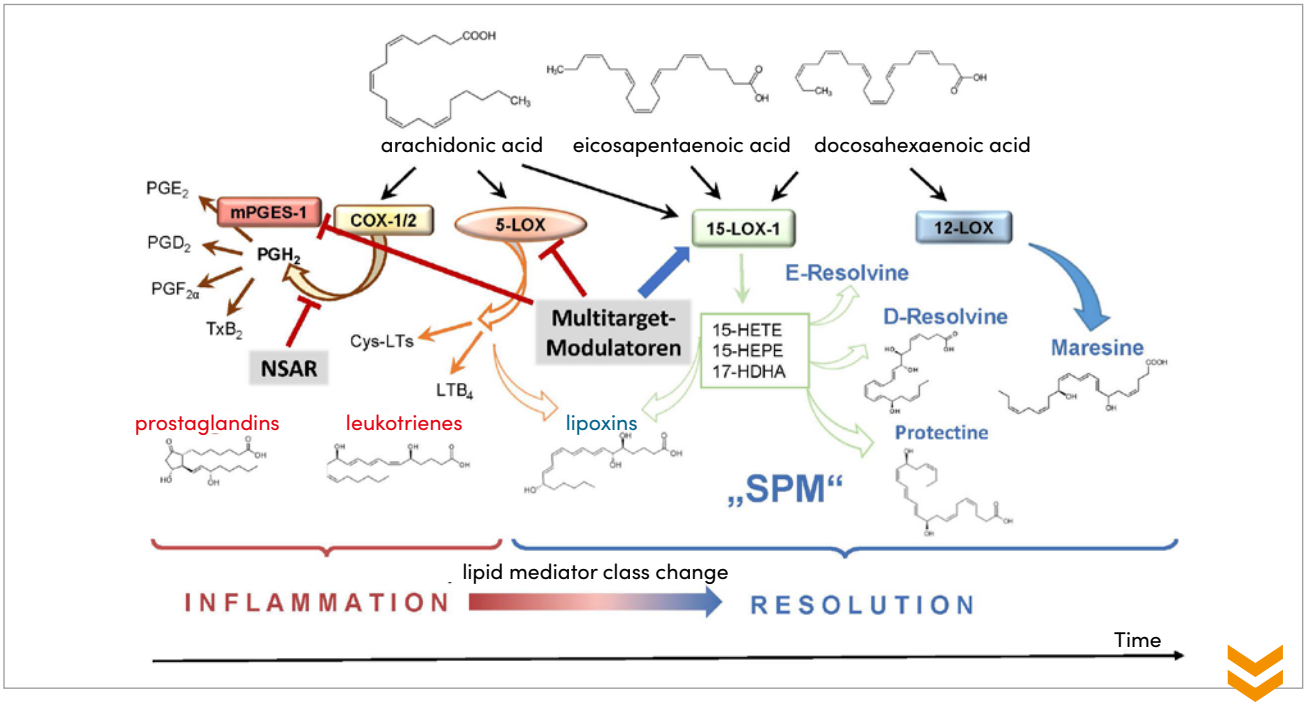

FIG. 2 Lipid mediator biosynthesis (simplified) and targets of active substances. Prostaglandins and leukotrienes promote inflammation, while the 'lipid mediator class switch' leads to SPM production and thus initiates resolution. NSAIDs inhibit the formation of all prostglandins by blocking cyclooxygenases (COX). Multitarget modulators specifically inhibit leukotriene and prostaglandin E2 formation by blocking 5-lipoxygenase (5-LOX) and mPGES-1, and increase SPM production by activating 15-lipoxygenase (15-LOX). This promotes the 'lipid mediator class switch' and thus resolution.

shown that the lead compound acetyl-keto-boswellic acid (AKBA) is able to programmes 5-lipoxygenase in immune cells relevant to inflammation by allosteric binding in such a way that the formation of leukotrienes is inhibited and the enzyme takes on the function of a 12 / 15-lipoxygenase and thus produces increased levels of SPM [17]. SPM formation is further enhanced in immune cells by AKBA binding to a very specific site on 15-lipoxygenase-1, thereby directly activating this enzyme to produce SPM [18]. Results from experiments with mice in an inflammation model confirm this mode of action in living organisms as well and show an accelerated resolution of inflammation. In addition, classical boswellic acid acts as an inhibitor of mPGES-1 and inhibits, for example, excessive PGE2 formation and inflammation in mice in the peritonitis model [19]. This makes boswellic acids prototypes for modulating 'lipid mediator class switching' and models for other active ingredients that could be used to promote inflammation resolution. In fact, celastrol, a pentacyclic triterpenoid acid from the anti-inflammatory Wilfords three-winged fruit, shows similar molecular interactions with 5-lipoxygenase and 15-lipoxygenase-1 as AKBA. It thus suppresses the formation of leukotrienes and stimulates that of SPM [20]. But structurally different active ingredients such as chalcones from the Asian medicinal plant Melodorum fruticosum [21], a biflavinoid from the Cambodian dragon tree (Dracaena cambodiana) [22] or the custom-made synthetic substance BRP-201 [23] also promote 'lipid mediator class switching' in human immune cells and in the mouse peritonitis model by targeted multitarget modulation. Finally, the approved phytotherapeutic Traumeel® S, consisting of 14 mainly herbal ingredients, including arnica, witch hazel, echinacea, calendula and comfrey, was shown to promote resolution [24]. The various active ingredients intervene at several points in the inflammatory process and improved the ratio of eicosanoids to SPM in human cells in vitro and in the mouse peritonitis model in vivo.

CONCLUSION

In summary, the targeted modulation of multiple enzymes in lipid mediator metabolism by these active ingredients offers new options for the development of alternative strategies for the treatment of inflammation, with the aim of promoting the resolution of inflammation and regeneration. And all this without the side effects of previous anti-inflammatory drugs.

The bibliography can be found at the article at www.sportaerztezeitung.com

AVULSION FRACTURES OF THE PELVIS

Occurrence in young professional football

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Apophyses are so-called 'secondary ossification centres' at the insertion sites of muscle tendons and do not fully mature until the end of the second decade of life (puberty) [14]. Even before the bony fusion with the adjacent bone, they are subject to high tensile and bending forces, especially during intensive training, and are therefore very vulnerable to injury [1, 15 – 17].

Sports such as football, which involve a lot of sprinting and quick changes of direction or jumping with high muscle tension, are considered high-risk sports [16]. Although various factors are discussed in the context of puberty as possible causes, such as individual growth compared to peers, hormonal status and changes in biomechanical and neuromotor conditions [5 – 7], training load is a plausible treatment-relevant factor, especially for young footballers. Regular and intensive training can lead to overuse injuries in the form of repetitive microtraumas and in some cases even cause a complete tear, a so-called avulsion fracture. Avulsion fractures are rare, but their prevalence, especially in adolescent males, is significantly higher than in mature athletes [2]. Overuse injuries account for up to 40 % of all absences from youth football [18, 19]. In a study of almost 550 young footballers in the age groups U9–U19 and an observation period of four seasons, injuries to the growth plates (epiphysis and apophysis) were recorded as the most common reason for injury-related training absences in young professional football, along with contusions and sprains [2]. Avulsion fractures are often underestimated and inadequately treated, which, especially in professional football, can have not only sporting but also economic consequences for the athlete and the club, and in the worst case can even mean the end of the career.

DIAGNOSTICS

Athletes often describe a sudden shooting pain in the transition area from the buttock to the back of the thigh when sprinting or changing direction abruptly. This is already crucial for an initial assessment. Meanwhile, in most youth development centres, video material from training sessions or match days can be accessed via the match analysis department, which can help to understand the mechanism of the accident. Clinically, pressure pain in the area of the ischial tuberosity (lat.= tuber ischiadicum) and the adjacent insertion of the hamstring tendon complex (so-called conjoint tendon) is characteristic. Pain during active knee flexion or hip extension from a prone position, with or without reduced strength (side-by-side comparison), are also typical findings. Clinical manual examination is an important part of the daily physiotherapy treatment with the athlete and helps to recognise injuries in time and treat them accordingly, even in the overuse stage. In close consultation with the athletic director, adjustments to training loads are necessary when dealing with overuse reactions in the muscle tendon area and are often crucial to avoid long periods of downtime. Hypoechogenic areas in the tendon transition or irregular cartilage-bone transitions on ultrasound can provide initial indications of a structural injury. In particular, newer portable ultrasound models enable initial imaging findings to be made at the site of the injury. Due to the increase in general sporting activity in the population in recent years and the better understanding of sports-related injuries, it is recommended that MRI diagnostics be used more extensively, especially in junior competitive sports. Therapy-relevant diagnostic details and accompanying

pathologies, in particular the vulnerable growth plates, can be visualised in detail in MRI, even when conventional X-rays do not show an avulsion fracture in most cases.

THERAPY

Treatment is generally conservative and includes partial weight-bearing on crutches and limited hip flexion with combined knee extension. After six weeks, rehabilitation can begin with active range-of-motion exercises and careful muscle building. Full clearance for sports should always be given when the patient is pain-free and has fully recovered range of motion (ROM) and equal leg strength. According to current literature, almost 80 % of patients treated conservatively heal successfully, although there is a complication rate of up to 30 % [9]. Pseudarthrosis is a typical complication. Persistent symptoms and a strength deficit on one side compared to the other, even after more than 6 weeks, may indicate an impaired healing process, as in the case study presented here. Various studies in recent years show a trend, particularly in athletes, to treat fractures with a displacement of ≥ 1.5 cm surgically in order to achieve primary stability and avoid complications and long periods of inactivity [10 – 13].

CASE STUDY

A 16-year-old up-and-coming professional footballer presented with complaints in the posterior thigh / buttock area that had been present for four months. Initially, he had experienced a sudden shooting pain in the posterior thigh while challenging for the ball. Since then, he had experienced pain dependent on loading and a significant reduction in strength. Initially assessed as a 'muscle strain', a three-week break from training and several sessions of physiotherapy were prescribed. However, a pain-free return to full training could not be achieved. Clinically, there was an increased basal tone of the hamstring muscles and pressure pain at the ischium near the insertion point.

In the mobility test, hip flexion with an extended knee led to pain at the iliac hamstring tendon insertion point even at 70 °. The subsequent X-ray (Fig. 1) showed an avulsion fracture with complete detachment of the apophysis on the right ischium with incipient callus formation. The MRI of the pelvis (Fig. 2 a + b) clearly showed the avulsion with pronounced oedema in the fracture gap. The tendon insertion on the fragment appeared to be intact. The findings were discussed in detail with the parents and surgical treatment was indicated.

FIG. 1 X-ray – pelvic overview: avulsion fracture with complete avulsion of the apophysis at the ischium on the right with incipient callus formation.

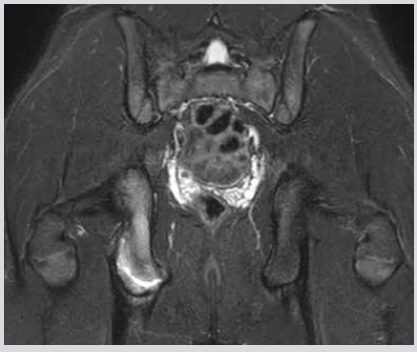

FIG. 2 A Pelvic MRI – coronal T2-STIR image without fat suppression showing the avulsion fracture and completely detached apophysis on the right ischium, as well as the intact tendon insertion on the fragment.

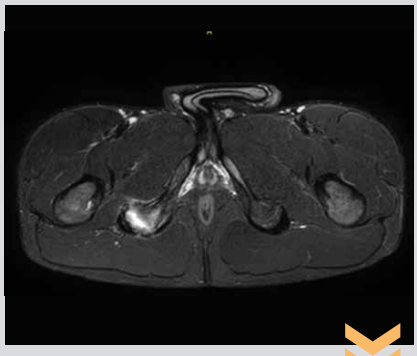

FIG. 2 B MRI of the pelvis – axial T2-STIR (short-tau inversion recovery) – image without fat suppression, showing significant oedema in the area of the fracture gap and a blurred cortical demarcation as an indication of incipient callus formation.

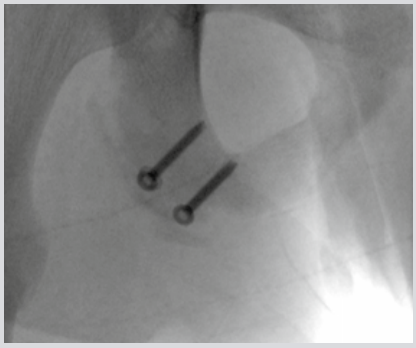

FIG. 3 A + B Intraoperative image intensifier control after repositioning and osteosynthesis with two small fragment screws and a washer.

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SURGICAL PROCEDURE AND FOLLOW-UP TREATMENT

The patient was placed in a prone position with the leg free to move. Access was gained via an approximately 8 cm long horizontal skin incision centred at the level of the gluteal fold. After opening the fascia, the fracture and the tendon insertion area were exposed and visualised, with extensive separation of the surrounding scar tissue of the surrounding scar tissue. The proximal parts of the hamstring tendon were also separated from the scar tissue for later repositioning. Then the fragment was completely detached from the ischium. The fracture ends were freshened up with the sharp spoon, reduced using reduction forceps and fixed with a Kirschner wire. After reduction control under image intensifier – fluoroscopy, the fragment was fixed with 2 small fragment screws of approx. 30 mm length (Fig. 3 a + b). The hamstring tendon was also fixed to the remaining ischial tendon portion using FibreWibre® (FA Arthrex). When moving the leg, stable osteosynthesis and normal tendon tension were observed. After extensive rinsing and insertion of a drain, the wound was closed in layers. The follow-up treatment was early functional without orthosis and with partial weight-bearing (15 kg) on crutches for six weeks. The postoperative course was uncomplicated with close follow-up examinations. The X-ray check after six weeks (Fig. 4) showed timely fracture consolidation, so that a transition to full weight-bearing was possible. Further increases in load were carried out step by step and in close consultation with the team of physiotherapists in the rehabilitation department. The patient was only allowed to return to football-specific training after twelve weeks and when his leg strength was equal on both sides (isokinetic strength measurement).

FIG. 4 X-ray check-up after six weeks with timely fracture consolidation.

CONCLUSION

- Avulsion fractures of the pelvis are typical sports injuries, especially in young boys playing football
- Overuse injuries are among the most common reasons for a loss in youth football
- Overuse-associated apophysitis or tendinitis can lead to a traumatic avulsion fracture if inadequately treated in athletes and should therefore be investigated at the first clinical signs (pelvic attachment pain)
- MRI diagnostics is the gold standard and should be performed in adolescents at the slightest suspicion of apophysis involvement
- In most cases, therapy can be conservative, but patients with high athletic aspirations, especially professional athletes, should be treated surgically if the dislocation is ≥ 1.5 cm.

The bibliography can be found at the article on www.sportaerztezeitung.com

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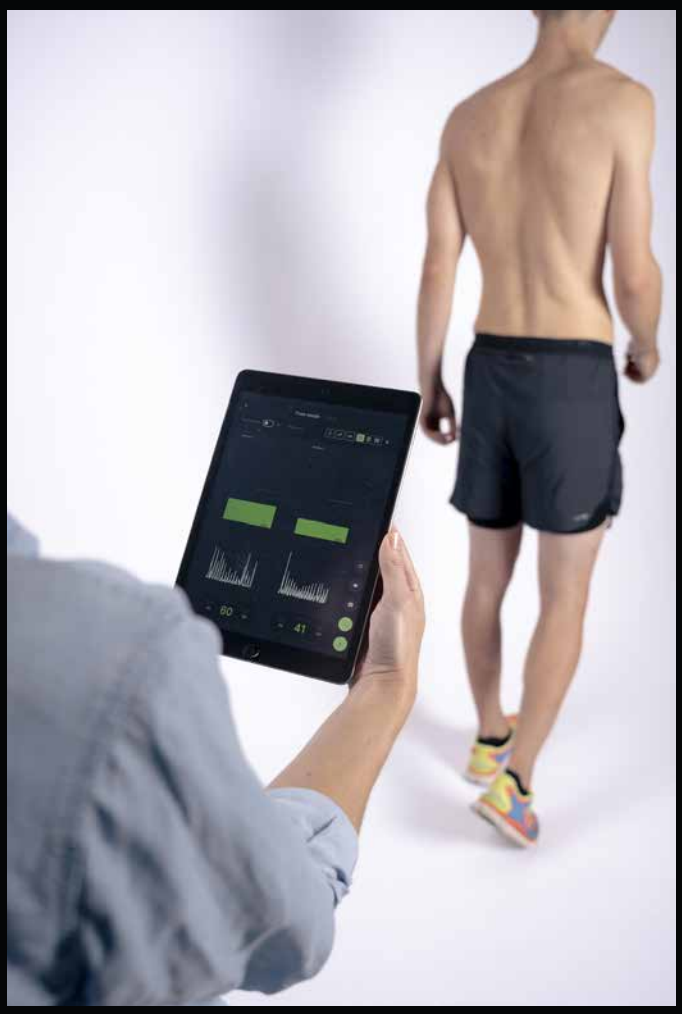
Monitoring Muscle Activity in Professional Football Using EMG



Read about EMG analysis and biofeedback training in our scientific article, created with our partners from Eintracht Frankfurt and 1. FSV Mainz 05 for the sports.medicine.newspaper issue 2024.

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PHYSICAL THERAPIES IN SPORTS MEDICINE

We make far too little use of the possibilities offered by physical therapy in sports medicine. This statement was not made by us but by our scientific advisor, Robert Percy Marshall, MD, team physician for RB Leipzig. He made this statement during a presentation at DKOU 2024, and we at sportärztezeitung wholeheartedly agree. For this reason, we would like to introduce you to this exciting field in the following issues and also show you in a very concrete and practical way the potential and advantages of the various therapy methods, such as extracorporeal shock wave therapy.

The range of treatments includes cryotherapy (radial and focussed), neuroreflective cryotherapy and heat therapy, laser therapy, electrotherapy, magnetic field applications, and magnetic resonance therapy. Peter Stiller gives a differentiated insight into the topic of cryotherapy on page 30 and in this context presentes the application of neuro-reflector hyperbaric CO2 cryotherapy paired with his experiences. Here you find an article by PD Anna Schreiner, MD on magnetic resonance therapy. What exactly is it, how does it relate to MRI, and how does it differ from magnetic field therapy? Supplemented by practical and application-oriented insights from the world of professional sport by Prof. Götz Welsch, MD (HSV). See also Case Tobias Würfel, MD on page 26. Our aim is to bring clarity to this topic.

sportärztezeitung

MAGNETIC RESONANCE THERAPY

Health starts in the cell

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Sports medicine and comprehensive conservative therapy should be broadly based, sensibly multimodal, ideally customised to the individual patient and open to new additions to the range of therapies. We sports physicians / doctors are on the right track, but we are nevertheless often confronted with a certain treatment gap, the desire for a more cause-orientated rather than purely symptom-orientated therapy and specialist training that does not always justice to this.

For historical reasons, physical therapy methods have been underestimated or only used to a limited extent in practice. In German-speaking countries, for example, magnetic resonance therapy (MBST®) or tNMR (therapeutic nuclear magnetic resonance) is little known despite many years of experience and (inter)national use. In addition to the often heterogeneous evidence-based medicine situation, the experience of the individual physician often plays a decisive role in determining therapeutic action, which for historical reasons – in addition to surgical methods – is predominantly characterised by interventions in chemi-

cal processes and less by the application of physical principles. Naturally, these in turn could only be investigated after recognising the scientific correlations at a molecular and cellular level and corresponding disorders could only be addressed after discovering the electrical processes in the living body. Most recently, the interdisciplinary field of quantum biology has developed from this [10].

This article sheds light on this therapeutic principle, which starts at the level of causal cell health, has a symptomatic effect, has enormous potential and positively modulates Nobel Prize-winning cell processes. In addition, previous areas of application – including professional sports – are shown and this is differentiated from other methods for orientation purposes.

DISCOVERY, DEVELOPMENT & CLINICAL USE

In the early days of MRI (magnetic resonance imaging), test subjects and patients often had to be examined repeatedly and with long examination times. It was discovered by chance that some patients reported health improvements afterwards, such as better mobility, more energy or less joint pain. The developers of the later MBST® technology became aware of these results and discovered that the positive effect at the cellular level was triggered by the energy transfer to protons in resonance [1]. However, years of interdisciplinary research and development work were required to be able to utilise magnetic resonance technology therapeutically, i. e. to achieve this effect without the complexity of MRI and to develop a widely usable therapy system. Relevant tissue parameters such as proton density, repetition and relaxation times were determined for different tissues (bone, cartilage, etc.), taking into account the corresponding Larmor frequency. This therapy is based on the same physical principles as MRI but operates at a much lower magnetic field strength and uses significantly lower radio (pulse) frequencies (RF) (see Fig. 1).

Magnetic resonance therapy has been in clinical use since 1998 and is a non-invasive, drug-free, and pain-free therapy option, either as an alternative or supplement. It is used by medical professionals to treat various indications and tissue types in the case of complaints, injuries and painful, degenerative and/or pathological changes to the

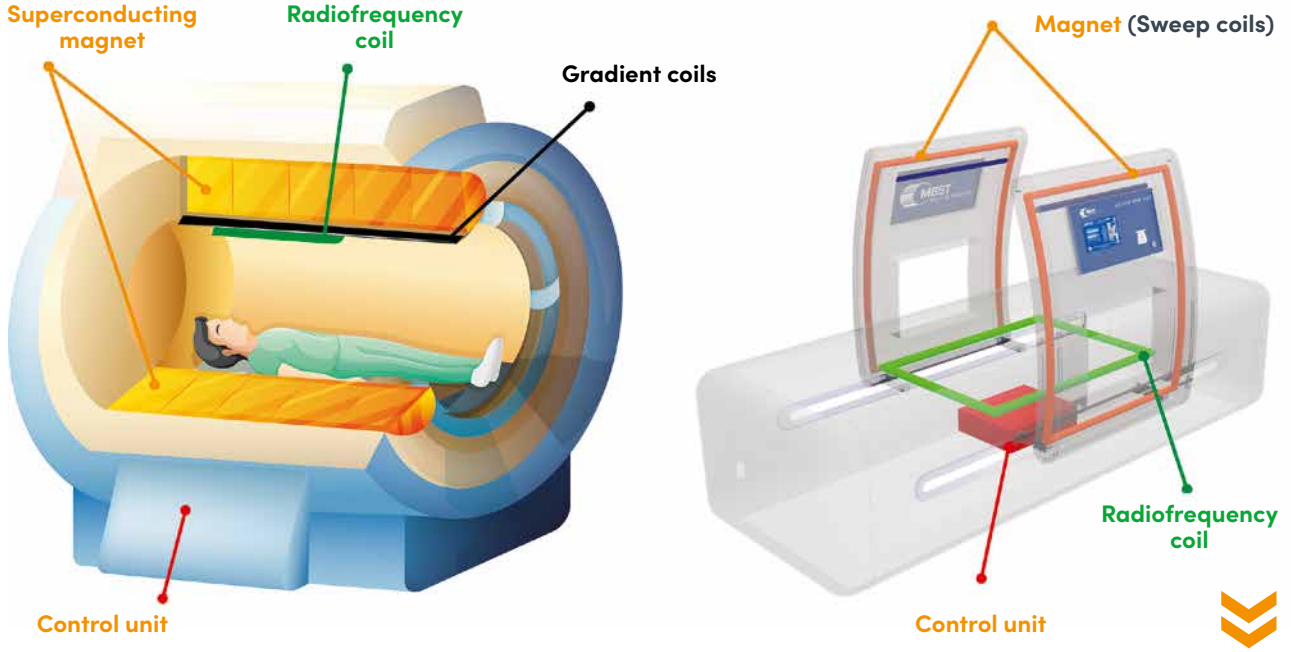

Fig. 1 Comparison of MRI vs. MBST® (example: ARTHRO•SPIN•FLEX 2)
MRI can visualise the different structures of various organic tissues through the excitation of hydrogen protons. This is based on the ability of hydrogen protons to absorb and release energy. The measurable signals differ depending on the type of tissue and are converted into complex sectional images. In tNMR, the various parameters are not used for imaging but are modulated in order to target different tissues therapeutically by changing the energy level transitions. Only damaged or deficient cells absorb the energy provided. Neither gradients nor detector or receiver coils are required for tNMR. However, this also means that no imaging is possible. Only approx. 0.4 mT is required instead of 1.5 – 3 T (the MRI magnetic field is approx. 20,000 times stronger than the earth's magnetic field). Special shielding is not required for tNMR. Compared to most conventional MRI devices, MBST® devices are quiet (as there are no gradient coils), have an open design, are space and energy efficient and do not require cooling.

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musculoskeletal system. With regard to contraindications, MRI should be used as a guide. The devices (MBST®) are Class IIa medical devices and approved in accordance with EU 2017/745 Medical Device Regulation (MDR) and require therapy cards containing the tissue-specific software.

THE PHYSICS BEHIND IT: LOW MAGNETIC FIELDS AND RADIOFREQUENCY AS EFFICIENT PARTNERS AND DIFFERENTIATION FROM SIMILAR PHYSICAL THERAPY METHODS

In nuclear magnetic resonance therapy (tNMR), the human body is not exposed to any harmful radiation. Instead, both MRI and tNMR devices use magnets and radio signals that measurably influence hydrogen protons in the body, which consists of approximately 70 % water, in the short term and – in contrast to the geomagnetic field – align them in a targeted manner for a limited period of time. The respective tNMR power parameters to establish nuclear magnetic resonance conditions with the target tissue, successive radio frequency impulses and to repeat the treatment parameters tissue-specifically depending on the phase are:

- Radio frequency power: max. 1 W at resonance
- Radio frequency range: 13.5 – 18 kHz
- Magnetic field strength: max. 1 mT

To generate nuclear magnetic resonance in tNMR, three coordinated fields of different properties are required: A static main magnetic field, a variable, long-modulated "sweep" magnetic field parallel to the main magnetic field and an alternating electromagnetic field that satisfies the Larmor frequency condition (for hydrogen atoms) and must be perpendicular to the other fields. The output signals each contain a modulated, rectified magnetic field with a static component and a modulated alternating field.

The relevant effect for the treatment is the so-called Adiabatic Fast Passage (AFP). Put simply, energy is only transferred if the transmitter (MBST®) and receiver (tissue) have the same parameters, i. e. resonance conditions exist. This physical principle has been confirmed by scientific reports [1, 2].

The most common risk of confusion to date is with (so-called non-invasive) magnetic field therapies (MFT). Here, devices generate static or pulsating fields of various kinds. The frequency, the periodic change of direction and the intensity of the magnetic field can be individually adjusted. In contrast to tNMR, this is not a therapy that produces nuclear magnetic resonance based on the parameters, but rather a wide range of different magnetic fields with heterogeneous evidence. tNMR is a non-comparable and much more complex method compared to conventional MFT. In contrast to the ionic functional principle of MFT, in tNMR the energy transfer is carried out at the proton level of the hydrogen atoms in resonance. As the human body consists of almost 80 % water, energy can be optimally transferred into the tissue almost without loss via this route. tNMR is an independent, innovative and unique therapeutic procedure in terms of bio-physics. It is the only non-invasive method in the world that works directly at the hydrogen proton and therefore cell level.

You can read more about MFT such as PEMF, magnetic field mats, rPMS, TMS, EOS as well as radio frequency therapy and electrotherapy including TENS in the online article.

UNDERSTANDING THE CELLULAR LEVEL – CIRCADIAN CELL CLOCK AND CO.

In order to understand why tNMR referred to as healing at the cellular level, is necessary to take a closer look at relationships that have so far been little known in everyday clinical practice. Living organisms are a highly complex biological system with numerous molecular, biochemical and bio-physical processes. Biological homeostasis is self-regulating and requires healthy cells. The body consists of cells and almost 80 % water (in tissue, cytoplasm, etc.). tNMR utilises the ubiquitous water protons in a tissue-specific manner and modulates various cell processes in the sense of homeostasis. An important aspect of cellular processes is the so-called circadian cell clock. This is an endogenous oscillation of metabolic activities with a periodicity of approx. 24 hours. All our cells in the body have such an internal clock, which consists of clock genes or proteins. The internal clock of the cells controls cellular signalling pathways such as the basal (sugar) metabolism, the mitochondrial respiration, immune and stress response or cell division. An "adjustment of the clock" is associated with a variety of diseases [3 – 9]. tNRM has been shown to influence the cell clock [3, 10, 11]. In basic science tNMR studies, for example, it was shown that the combination of weak magnetic fields in combination with radio waves has a clear influence on the signalling pathways of the cell – such as the internal clock, the basic cell metabolism or the oxygen signalling pathway [11 – 13]. This means that tNMR also has a positive influence on the balance of free oxygen radicals [12]. These so-called ROS (reactive oxygen species) not only have a harmful effect if too much of them are formed, but are also necessary for the fine control of cellular signalling pathways. High ROS concentrations ultimately lead to irreparable damage to macromolecules and DNA and can trigger cell apoptosis. The findings on hypoxia-controlled signalling pathways were awarded the Nobel Prize in 2019 ("When cells get out of breath" – Kaelin, Ratcliffe, Semenza [14]) and are also described in connection with osteoarthritis and bone metabolism, for example [15, 16].

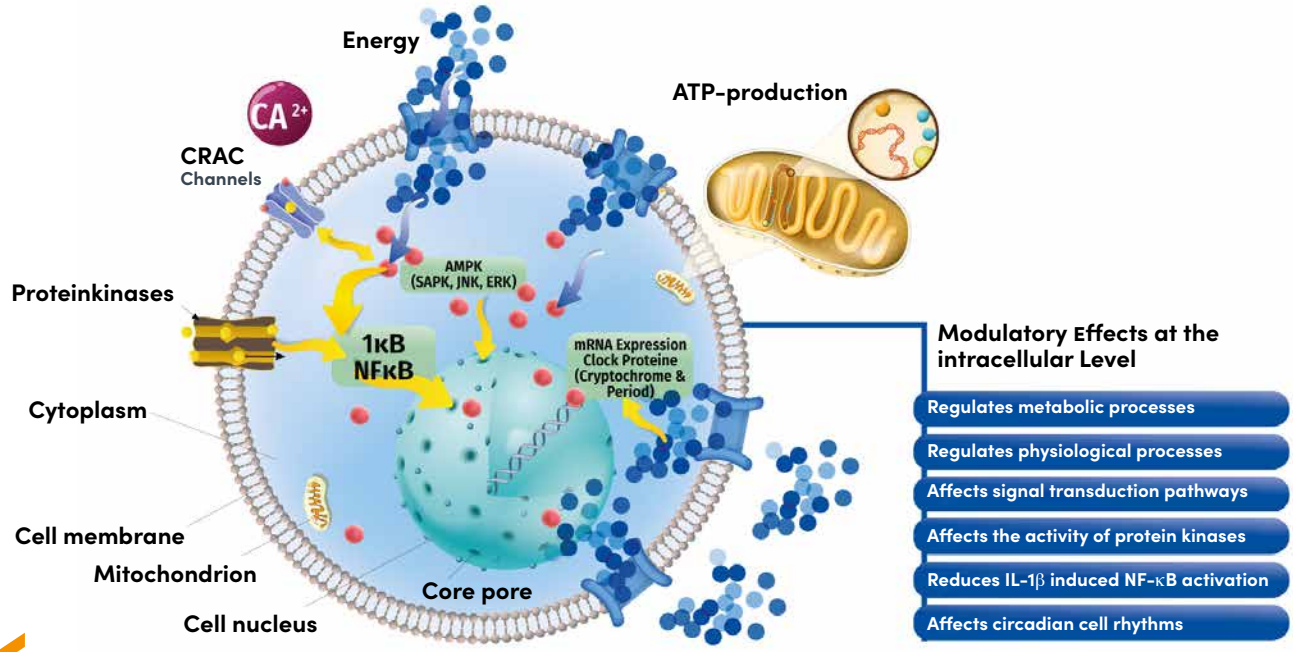
In addition to other in vitro studies showing that tNMR reduces inflammatory and catabolic mechanisms and stimulates anabolic effects (see also the arthrosis model) [17, 18], the Innsbruck research group has repeatedly demonstrated the connection between the circadian cell clock and the hypoxic signalling as described above [3, 11 – 13, 19, 20]. Ultimately, tNMR can be used as a kind of switch for the cellular clocks and thus the metabolism of both human and veterinary cells. In another study it was shown that tNMR accelerated the regeneration of dorsal root ganglia in vitro [21, 22]. In summary, tNMR can activate the body's own natural repair mechanisms, support regeneration, tissue remodelling and healthy cell function and alleviate inflammatory processes.

MUSCULOSKELETAL APPLICATIONS AND CLINICAL EVIDENCE

MBST® is widely used to treat osteoarthritis, osteoporosis, and both acute and chronic sports injuries. It is also applied postoperatively for optimised wound healing, back pain, and pain management (both analgesic and anti-inflammatory) [1]. In terms of tissue types and treatment areas, cartilage (cartilage damage, arthrosis), bones (bone oedema, osteoporosis), intervertebral discs (herniated discs, back pain), nerves (nerve damage, pain) and muscles / tendons / ligaments (sports injuries, overuse reactions) can be addressed. tNMR can be used both as a standalone therapy and, more importantly, as part of a modern multimodal treatment approach. There are numerous studies, including nearly 30 relevant publications on MBST®, covering both clinical and scientific research. This includes collaborations with universities, research institutions, clinics, and medical practices worldwide. No side effects or complications have been reported so far in in any of the applications and procedures to date. In addition to various other specialist publications, the relevant publications (in addition to the basic scientific data presented above) are retrospective, but also prospective, controlled clinical studies of varying quality. The following main statements, among others, were shown in various studies [1, 23]:

- Pain reduction in osteoporosis, fewer osteoporosis-related complaints, i.e. improved quality of life, increased bone density (qCT), increased bone formation markers, fracture risk reduction [1, 24 – 32]
- Significant medium to long-term pain reduction in osteoarthritis, improvement in quality of life and joint function, optimisation of degenerated cartilage structures (according to the Eckstein procedure) [1, 33 – 40] ; additive in-vitro: modulation of cartilage metabolism

Illustration of the therapy area (blue) for magnetic resonance therapy (e.g. ARTHRO•SPIN•FLEX 2)
Among other things, the tissue-specific Larmor frequencies and relaxation times are used to actively influence the target tissue (protons are only excited under tissue-specific resonance conditions in the target area, here blue).



Overview of the molecular mode of action of nuclear magnetic resonance therapy at the level of cell metabolism

Biological homeostasis is self-regulating. It maintains the structural stability of cells, tissues and processes. Only healthy cells fulfil their tasks and ensure the functionality of tissue processes. Water is essential for almost all cell functions and for maintaining homeostasis. MBST® uses hydrogen protons, can increase ATP production, reduces the influence of hypoxia conditions, influences cellular energy production, leads to a reduction in lactate concentration and influences the cellular circadian rhythms towards a re-synchronisation of the cell clocks.

(see HIF1α, reduction of lactase level), modulation of IL-1β-induced inflammatory reactions, positive influence on chondrocytes / osteoblasts [41, 42]

- Long-term improvement of Back pain, longer-lasting rehabilitation effect, reduction in sick days [43 – 48]
- Part of the successful multimodal treatment of muscle injuries (see article in sportärztezeitung) [49].

Case reports and application data also cover the area of neuralgia (PNP, CRPS, fibromyalgia, etc.), wound healing disorders, osteo-necrosis and numerous applications for acute and chronic sports injuries (see also articles in the sportärztezeitung). The various device types are certified in accordance with the EU standard for medical devices (EU 2017/745 MDR), including a regular evaluation report on safety and efficacy, and MBST® has now been tried and tested in more than 2 million hours of therapy. There is also a mobile device version for the sports medicine sector.

Sports physicians and team doctors from Bundesliga teams, top international teams and Olympic athletes are already using it successfully – currently in Germany, for example, at HSV (Prof. Götz Welsch, MD) and Basketball Löwen Braunschweig (Nico Fiedler, MD).

OUTLOOK AND SUMMARY

To summarise, it can be said that tNMR is a long-established and successful procedure that is increasingly emerging as a relevant partner for modern multimodal therapy in a patient-individualised multimodal setting, not least due to the latest basic scientific data and increasing national and international clinical experience in the professional sports sector and orthopaedics as a whole. The experiences of many colleagues and patients often describe magnetic resonance therapy as "the missing piece" that can help to close a treatment gap. Further studies are underway to optimise the evidence base. Particularly in the case of chronic common diseases such as osteoporosis and arthrosis, this therapy may a be a meaningful option in view of the socio-economic situation. Basic research is also constantly being carried out to explore further mechanisms of action, optimise treatment approaches and further therapy. This is what sport is all about, "to get all the horsepower back on the road", i. e. to enable a successful and efficient return-to-sports etc. or to generally help patients to recover, or at least to reduce symptoms and improve their quality of life. If we continue with the car analogy, MBST® can help optimise cellular function, much like fine-tuning an engine. However, the whole thing also needs the right fuel, i. e. nutrients, vitamins, trace elements etc. in the form of food, food supplements, supplements etc. The vehicle also needs to be moved, i.e. training in whatever form. If a targeted repair is required due to ageing, an accident or similar, further physical therapies, orthobiologics and, if necessary, interventional procedures are used.

The bibliography can be found with the article at www.sportaerztezeitung.com

» INSIGHTS FROM PROFESSIONAL SPORT

FROM PROF. GÖTZ WELSCH, MD

In competitive sport, and particularly in professional football, many of the things mentioned earlier in the article play an important role. Firstly, optimal tissue regeneration is extremely important, regardless of whether it is an acute or chronic injury, or microtrauma, e.g. during a Bundesliga match.

The time factor also plays an important role. How can I get a footballer back on the pitch as quickly and safely as possible? In addition to medical, physiotherapeutic or osteopathic treatment, we use a wide range of physical therapies for chronic or acute injuries in professional sport, as mentioned at the beginning of the article. These forms of therapy must complement each other sensibly with the aim of accelerating tissue regeneration. After 12 months of experience with magnetic resonance therapy (MBST) in the context of supporting a professional football team, this form of therapy has proven to be an extremely useful addition to a multimodal treatment spectrum. As part of the therapy concept for typical injuries and overuse injuries in professional football, the team doctors manage the rehabilitation processes together with the physiotherapists and rehab/athletic trainers. Physical forms of therapy play a key role here and are applied differently depending on the injury. MBST has now become a very important component. We use the "ARTHRO•SPIN•FLEX 2" magnetic resonance therapy treatment device for the following indications:

- Chronic cartilage damage in the knee and hip joint
- Bone bruises / bone marrow oedema (acute or chronic)
- Muscle injuries (both contusions and overloads / DOMS, strains, fibre and bundle injuries)
- Acute joint injuries (ankle, knee, shoulder, etc.)
- Back pain, intervertebral disc pathologies, spondylolysis
- Post-operative

It can be seen that these indications include the majority of all sports injuries and overuse injuries that occur in a professional football team. Depending on the affected structure, the specific MBST tissue types (e.g. cards for cartilage / osteoarthritis, bones, tendons, muscles, ligaments, intervertebral discs) are used.

The aim of multimodal combination therapy is to initiate various regenerative processes and utilise them alongside or with each other. In this way, the self-healing process should be supported and, if necessary, accelerated. Among other things, the aim is to achieve a modulation and resolution of the inflammatory processes that take place as part of this healing process. At the cellular level, as described above, homeostasis should be established, cell permeability and mitochondrial activity should be increased (increased energy supply) and cell metabolism and protein synthesis should be activated. The aim is to improve microcirculation and stimulate the secretion of nutrients, growth hormones and stem cells are activated in the healing process.

Individual physical measures have an impact on different, complementary processes in this cascade and often enable faster and more intensive treatment, while at the same time accelerating regenerative processes. Depending on the pathology, MBST is used together with microcurrent, shockwave, deep heat, laser, but sometimes also together with pulsating magnetic field therapy. A major advantage of MBST is certainly its tissue specificity and the possibility of treating even very deeply localised or intra-osseous pathologies in a targeted manner.

While magnetic resonance therapy can achieve a time advantage in the healing process for acute injuries, it is a very effective addition to the therapeutic procedure for chronic processes (cartilage damage / osteoarthritis, inflammation of the pubic bone / tendon attachment tendinopathies) and bone marrow oedema, which is often difficult to treat.

The aforementioned device has been accepted extremely well as part of team care. The 60-minute therapy time is very well tolerated by the athletes and we also use this for parallel treatments, e.g. microcurrent or ionising oxygen therapy. This therapy is planned and scheduled by the physiotherapists in consultation with the team doctors.

ISOKINETIC MEDICAL GROUP

EARLY POSTOPERATIVE COMBINED PHYSICAL THERAPY FOLLOWING HAMSTRING TENDON REFIXATION

This case report describes the early postoperative management of a subtotal proximal hamstring tendon avulsion treated with transosseous refixation. A structured rehabilitation program, including radial extracorporeal shockwave therapy (rESWT), magnetic resonance therapy (MBST), and neuroreflexive hyperbaric CO_2 cryotherapy, facilitated effective pain relief, reduced inflammation, and accelerated functional recovery. The treatments were well-tolerated, and no adverse effects were reported, demonstrating their safety and efficacy.

PATIENT HISTORY

A 39-year-old male recreational soccer player sustained an acute proximal hamstring tendon avulsion during a non-contact sports-related incident. Sonography revealed extensive hematoma and loss of proximal hamstring musculature structure, confirmed by MRI, which demonstrated a subtotal (but nearly total) tendon avulsion with minimal residual fibers attached to the ischial tuberosity. The patient experienced severe pain (VAS: 3 at rest, 10 with movement) and significant functional impairment.

SURGICAL INTERVENTION & REHABILITATION PROTOCOL

On postoperative day (POD) 0, the patient underwent transosseous refixation of the hamstring tendon at a specialized orthopedic center. Postoperative recovery was uncomplicated, and a multdisciplinary rehabilitation program commenced on POD 5. The rehabilitation focused on pain relief, inflammation control, and functional restoration, utilizing therapies that were well-tolerated and free of adverse effects.

Radial Extracorporeal Shockwave Therapy (rESWT)

The rESWT was performed using the Swiss DolorClast system (Electro Medical Systems, CH). Treatments targeted the dorsal thigh and gluteal region, sparing the surgical wound until healing was complete. Each session utilized 10,000 – 20,000 impulses at patient-specific pressures ranging from 2.0 to 4.0 bar.

Timepoints of rESWT Sessions:

- POD 5: Initial session (2.0 bar, 10,000 impulses).
- POD 6: Second session (2.5 bar, 15,000 impulses).
- POD 8: Third session (2.7 bar, 15,000 impulses).
- POD 19: Fourth session (3.4 bar, 15,000 impulses).
- POD 22: Fifth session (4.0 bar, 15,000 impulses).
- POD 33: Sixth session, including the knee region (4.0 bar, 15,000 impulses).
- POD 50: Final session (4.0 bar, 15,000 impulses).

Magnetic Resonance Therapy (MBST)

MBST was performed using the MBST Arthro Spin Flex system (MedTec Medizintechnik GmbH, DE) to stimulate tissue regeneration and cellular repair. Seven sessions were administered between POD 5 and POD 12.

Neuroreflexive Hyperbaric CO_2 Cryotherapy

Cryotherapy was performed using the Cryolight system (Elmako, DE) during rESWT sessions on POD 6, POD 8, and POD 22, providing additional pain relief and inflammation control.

Progressive Mobilization

Crutch-assisted ambulation began on POD 1. By POD 22 (approximately 3 weeks postoperatively), the patient no longer required forearm crutches, reporting improved stability and confidence. Independent walking, including a 5-km walk during vacation, was achieved by POD 33 (approximately 5 weeks postoperatively).

Physiotherapy

Physiotherapy targeted muscle strength and coordination while addressing lumbar spine stabilization. By POD 50 (approximately 7 weeks postoperatively), the patient resumed jogging, albeit with mild residual muscle imbalance and lumbar tightness.

CLINICAL OUTCOMES

Pain and Mobility Pain relief was rapid, with significant improvement noted by 3 weeks postoperatively. Functional milestones were achieved progressively: independent walking by 3 weeks, a 5-km walk by 5 weeks, and a return to jogging by 7 weeks postoperatively. Muscular Recovery Residual muscle atrophy and strength asymmetry were evident at 5 weeks, though neuromuscular function showed continued progress with physiotherapy. By 7 weeks, the patient was able to jog short distances without pain or instability. Imaging Follow-up MRI at 5 weeks confirmed intact tendon refixation without retraction and only minor residual edema in the surrounding musculature. The patient reached RTC (back on the football field) exactly 5 months after the injury.

CONCLUSION

Early postoperative combined physical therapy, including MBST and rESWT as the primary modalities, alongside cryotherapy, and progressive mobilization, facilitated a safe and effective recovery after proximal hamstring tendon refixation. Pain relief, inflammation control, and gradual functional restoration were achieved much faster and without complications or therapy-related adverse effects. The treatments were well-tolerated, confirming their safety in postoperative rehabilitation. By 7 weeks postoperatively, the patient had already returned to jogging. By the help of ongoing physiotherapy and individual increase of the trainings load the patient reached fully balanced muscle regeneration and optimal functional outcomes. He returned on the football field (RTC) exactly 5 months after the injury.

Tobias Würfel, MD sports orthopaedics section at the Rechts der Isar Clinic of the Technical University of Munich & Peter Stiller, Specialist in General Medicine and Sports Medicine, MedWorks Augsburg

Hear this presentation

Tobias Würfel, MD
at Isokinetic Conference 2025 at
Sunday, May 4, 09:26 (Noroeste-1)

Workshop MBST –
Faster return to sport
Peter Stiller, Sunday,
May 4, 9 – 10 am (Flexibox 1)

Selection of other presentations at the Isokinetic Conference:

- **Personality & performance in elite youth football: success starts in the mind?** Alexander-Stephan Henze, MD, Saturday, May 3, 14:16 (Flexibox 1)
- **Muscle injuries: Balancing biological healing and functional recovery in 2025** Prof. Werner Krutsch, MD, Saturday, May 3, 14:30 (Auditorio)
- **Impact of ESWT on recovery in acute hamstring injuries. Sham-Controlled trial** Javier Crupnik, MD, Saturday, May 3, 16:54 (club norte)

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SHOCKWAVE THERAPY – MUSCLE INJURIES AND TENDINOPATHIES

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Have you also noticed that reports of successful therapy in professional athletes are presented at almost all events on sports medicine (congresses, symposia, continuing education events, etc.), but almost never in the context of clinical studies? There are many understandable reasons for this, but our knowledge of optimized therapies for these patients remains limited as a result.

So I was all the more delighted when Javier Crupnik from Buenos Aires, Argentina, approached me a few years ago to ask if I would be willing to co-supervise his doctoral thesis in sports medicine. Javier Crupnik is not just anyone; among other things, he was the head physiotherapist for Argentina's men's national volleyball team. His many contacts in professional Argentinian sports enabled him to treat players from a prominent club in the province of Buenos Aires who had suffered acute type 3b hamstring injuries according to Müller-Wohlfahrt, as part of a randomized controlled study. All patients were at the level of US college athletes and had received scholarships for their studies, for example.

Now we really wanted to know: what can radial extracorporeal shockwave therapy (rESWT) (3 times a week, a total of 9 therapy sessions) achieve as an add-on to an absolute high-end physiotherapy and rehabilitation programme for such injuries? It is certainly no secret that the conditions in Buenos Aires are much more difficult than here in Germany.

Thanks to generous funding from Robert Erbeldinger (sportärztezeitung; Mainz, Germany) and Berthold Nickl (PRO Profil Gesellschaft für individuelles Karrieremanagement mbH; Putzbrunn near Munich, Germany), we were able to conduct the study at an extremely high level.

And we were not disappointed. A mean time to return to sport of 28.3 ± 4.5 days (mean ± standard deviation), achieved only by the high-end physiotherapy and rehabilitation programme, had not yet been reported in the international literature; many reported mean times to return to sport are sometimes significantly higher. And here, rESWT was even able to improve on this, reducing the mean time to return to sport to 25.4 ± 3.5 days. rESWT did not replace physiotherapy and the rehabilitation programme, but rather complemented it in a meaningful way.

Now, one could argue that the reduction of the mean time to return to sport by three days is not really significant and that the additional effort for the rESWT can be saved. In many cases, however, every single day counts (again for different reasons), and for an athlete's annual salary of $250,000 or more, the additional expense of rESWT is also financially worthwhile for the club. It was a great time with Javier and we all say 'Buenos días Argentina y gracias al Dr. Crupnik!'

Another study discussed here was much less spectacular, but certainly of equal relevance, albeit for a completely different patient group. In patients with tendinopathies of the supraspinatus tendon, in which partial tears have already formed, various physical measures, such as interference current therapy, short-wave diathermy and magnetic therapy, are often used, with good results. The main disadvantage of these therapies is the amount of work involved. So colleagues from the best medical school in China (Shanghai Jiao Tong University School of Medicine) approached me with the question of whether rESWT could help here – and it could. With 6 x rESWT (once a week for 5 minutes each time) the colleagues in Shanghai were able to achieve better results than with 30 x physical therapy (5 x per week for 45

minutes each time). In other words: treatment duration was reduced by 98 % and yet a better result was achieved... especially in China, but perhaps also for us, such improvements in treatment efficiency are of enormous importance.

COMBINED SHOCK WAVE THERAPY FOR ACUTE INJURY TO THE THIGH MUSCLE (TYPE 3B)

In this controlled study of 36 semi-professional athletes (football, hockey, rugby), the hypothesis was tested that radial extracorporeal shock wave therapy (rESWT) + specific rehabilitation programme (RP) is more effective than sham rESWT + RP for acute hamstring injuries (type 3b). The results showed that the median time frame for return to sport was 25.4 days for the rESWT group and 28.3 days for the sham group, with the difference being statistically significant ($p = 0.037$). Both groups had similar satisfaction scores and only one patient from each group suffered a re-injury during the six-month follow-up period.

Radial ESWT combined with a specific rehabilitation program (rESWT + RP) is more effective than sham rESWT + RP for acute hamstring muscle complex injury type 3b: a randomized, controlled trial

Javier Crupnik, Santiago Silveti, Natalia Wajnstein, Alejandro Rolon, Tobias Wuerfel, Peter Stiller, Antoni Morral, John P. Furia, Nicola Maffulli, Christoph Schmitz

medRxiv 2025.01.03.24319763; doi: https://doi.org/10.1101/2025.01.03.24319763

RADIAL EXTRACORPOREAL SHOCK WAVE THERAPY FOR ROTATOR CUFF INJURIES

In this study, 60 patients with rotator cuff injuries without complete tears were randomly assigned to either radial extracorporeal shock wave therapy (rESWT) or treatment with physical therapy methods (PTMs). The results showed that the rESWT group had significantly higher ASES total scores and lower VAS pain scores compared to the PTM group at 6 and 12 weeks post-treatment initiation. rESWT also resulted in a significant reduction in the thickness of the supraspinatus tendon and an increase in the acromiohumeral distance. This study suggests that rESWT is a more effective treatment method, which is also accompanied by a drastic reduction in treatment time.

Radial extracorporeal shock wave therapy is more effective than a combination of physical therapy modalities for rotator cuff injury: a randomized controlled trial

Zheng Wang, Lan Tang, Ni Wang, Lihua Huang, Christoph Schmitz, Jun Zhou, Yingjie Zhao, Kang Chen, Yanhong Ma

medRxiv 2025.01.07.25320065; doi: https://doi.org/10.1101/2025.01.07.25320065

RADIAL EXTRACORPOREAL SHOCK WAVE THERAPY FOR ACHILLES TENDINOPATHY

Radial extracorporeal shock wave therapy (rESWT) is an established treatment for Achilles tendinopathy. A recent investigation reported that the addition of rESWT to a specific training programme did not result in significant improvements in pain and function compared to placebo treatment. The main criticism of the authors is that the energy density of the radial extracorporeal shock waves generated with the rESWT device used in this study (operated at air pressure between 2 and 5 bar at 10 Hz frequency) was too low to achieve positive clinical results. Thus, the recent study by Alsulaimani and colleagues discussed here may not fully reflect the effect of rESWT, and it is suggested that further studies be conducted to investigate the energy flux density (EFD) of the rESWT device used by Alsulaimani and colleagues.

Radial Extracorporeal Shock Wave Therapy for Insertional Achilles Tendinopathy: Energy Matters.

Schmitz, C.; Crupnik, J.; Morgan, D.; Silk, E.; Maffulli, N.; Morral, A.

Clin Rehabil. 2025 Feb 21:2692155251321013. Epub ahead of print.

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CRYOTHERAPY

Application of physical therapy – guided education

PETER STILLER / MEDWORKS AUGSBURG

Recently, and especially during and after the '14th Football Medical Symposium Hamburg' on 12 October 2024 at the Volksparkstadion (organised by Prof. Dr. Götz Welsch from the UKE Hamburg and the sportärztezeitung), I have received numerous requests regarding cold and cryotherapy after my lectures as part of the 'guided education' series. Therefore, I was asked by the sportärztezeitung to present the topic in more detail and hopefully shed a little more light on it.

FIG. 1 Cryolight neuroreflex therapy

FIG. 2 Cooling pad of the Hilotherm system, which goes around the knee. (see article cryotherapy. https://sportaerztezeitung.com/rubriken/therapie/14687/kryotherapie-2/)

When I and many of my sports and rehabilitation medicine colleagues use cryotherapy as part of a combination therapy, we primarily mean neuroreflectory hyperbaric CO2 cryotherapy (Fig. 1). We began covering this form of cryotherapy in the sportärztezeitung as early as 2015. Even then, we reported on its use and the excellent results primarily in combination with shockwave therapy, and later also with high-power laser therapy, as part of the 'guided education' of the sportärztezeitung – see also the following articles:

- Superior combination therapy
- Combination therapy in practice
- Neuroreflex cold therapy
- Extremely fast regeneration with combination therapy

In this topic, we can draw on both current literature and significantly positive study results. But what is at least as important to us is our very extensive and positive practical experience with both professional athletes and our everyday patients.

NEUROREFLEX HYPERBARIC CO2 CRYOTHERAPY

In regenerative medicine, each individual form of therapy used must be thoroughly understood in order to be able to combine them boldly and thus trigger synergistic effects. This short article will focus on the special role of neuroreflex hyperbaric CO2 cryotherapy as a successful physical therapy in sports medicine. In contrast to the well-known cold therapies (with cold water, ice, cooling wraps, cold spray, cool packs and ice sponges), as we know them from all sports and play facilities around the world, this special form of therapy uses CO2 gas, which leaves the special nozzle of the handpiece at a pressure of 0.3 bar and a temperature of –78 °C to cool the affected skin area to 0 – 4°C in about 3 – 5 seconds. This extreme cold in combination with the pressure not only achieves local but also systemic vasoconstriction. The following effects arise:

- **Analgesic**
  Alleviates pain within seconds
- **Antiphlogistic**
  Restores the semi-permeability of the cell membrane and stops inflammation and oedema formation.
- **Lymphatic**
  Gas pressure + extreme cold – vasomotor effect and anti-oedema
- **Neurological**
  Reduced nerve conduction and transmission at the neuromuscular end plate, thereby relaxing the muscle fibres

An extremely fast-acting and very important effect for further regeneration is the restoration of the semi-permeability of the cell membrane and thus of the cell function, as well as the stopping of the inflammatory cascade and the associated oedema formation and pain. The additional lymphatic effect and the strong muscle-relaxing effect are helpful in many situations in practice.

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PETER STILLER

is a specialist in general practice and emergency medicine at the practice Allgemeinmedizin Lechhausen & MedWorks – Privatärztliche Praxis, Augsburg. He is a former team doctor of the professional team of FC Augsburg 1907.

A very interesting topic in connection with the effect of neuroreflectory hyperbaric CO2 cryotherapy, but one that is far from being fully understood, is the mechanism of action via TRPM8 channels (Transient Receptor Potential Melastatin 8). These play a central role in the recognition of cold environmental temperatures in the somatosensory system. TRPM8 occurs in a subgroup of non-myelinated (C-type) afferents. Its therapeutic use is currently being researched intensively.

WHAT DOES EXPERIENCE TELL US?

From my many years of experience in sports and rehabilitation medicine, I can say with conviction that I cannot imagine my individualised therapy concepts without neuroreflex hyperbaric CO2 cryotherapy (Cryolight). The effects of pain relief, decongestion, temperature regulation and muscle relaxation are impressive, lasting and reproducible in almost every case. This form of therapy is easy to use, very safe due to the device's immediate safety shutdown function (when the temperature is colder than –2 °C for more than 2 seconds), and, above all, it takes effect very quickly. This extremely rapid effect can be the deciding factor in getting recovery started quickly in cases of acute inflammation or injury. But I would also never want to be without it again when treating chronic inflammation. In this case, it is possible to use the analgesic effect before treatment with radial or focused extracorporeal shock wave therapy (ESWT), for example, but I favour application after ESWT treatment or – ideally – high-power laser + ESWT treatment.

In this case, the analgesic effect of the laser and the prostaglandin E2 inhibition before the ESWT treatment are used to increase the treatment energy and thus the effect of the ESWT even more and to achieve a pleasant additional pain relief and muscle relaxation at the end through cryotherapy. We were also able to determine that the sometimes severe initial worsening of other therapies (ESWT, acupuncture, MBST, acupressure, ...) could be significantly reduced if the neuroreflectory hyperbaric CO2 cryotherapy was applied at the end. We use it for severe local allergic reactions (e.g. after insect bites), all types of (sports) injuries, arthritis attacks, tendinopathies / enthesopathies, gout attacks, early post-operative or also for trigger point therapy for chronic or acute myogelosis. And this form of treatment is simply indispensable in our individual combination therapy concepts.

In this context, the effects and possible treatment strategies from the following articles are also very interesting and recommended for further study:

- Hyperbaric Gaseous Cryotherapy: Effects on Skin Temperature and Systemic Vasoconstriction (https://www.sciencedirect.com/science/article/abs/pii/S0003999307012609)
- Effects of microcurrent and cryotherapy on C-reactive protein levels and muscle tone of patients with rotator cuff reconstruction (https://www.jstage.jst.go.jp/article/jpts/30/1/30_jpts-2017-468/_article)

CONCLUSION AND OUTLOOK

In this article, we looked at one of the most promising forms of cryotherapy currently on the market. In my opinion, this type of cryotherapy is still very much underestimated and its true potential for treating the musculoskeletal system is far from being exhausted. Or why doesn't every high-class sports club have a device like this on the sidelines? I am sure that we will be hearing and reading a lot more about this method and its possible uses in the future, as well as the therapeutic options via the TRPM8 channels mentioned. Of course, numerous members of the editorial board of the sportärztezeitung will keep you constantly up to date with practical experiences, new promising combination possibilities and also about other forms of cold therapy, such as whole-body cold therapy or also continuous cooling (see Fig. 2).

COMBINATION OF EXTRACORPOREAL SHOCK WAVE THERAPY (ESWT) AND PHYTOPHARMACEUTICAL THERAPY (NUTRITIONAL THERAPY)

Superior Combination Therapy – an innovative approach to reducing inflammation and promoting tissue regeneration

Inflammatory processes play a central role in many musculoskeletal diseases. Extracorporeal shock wave therapy (ESWT) has proven to be an effective method for pain reduction and inhibition of inflammation by acting on the neurogenic inflammatory cycle via the nervous system. Its direct effects on the biochemical mechanisms of inflammation in cells and tissue do exist, albeit to a limited extent. In this context, the combination with phytopharmaceutical agents such as curcumin, boswellia, bromelain and anthocyanins can achieve a synergistic effect by specifically modulating tissue-specific, intracellular inflammatory processes.

MECHANISMS OF ACTION AND SYNERGY EFFECTS

Neurogenic inhibition of inflammation by ESWT

» Activation of nerve fibres and modulation of the pain signal
» Improvement of local blood flow and tissue regeneration
» Indirect reduction of inflammatory mediators

Direct biochemical inhibition of inflammation by phytopharmaceuticals

» **Curcumin** Inhibition of NF-κB and COX-2, reduction of oxidative stress reactions
» **Boswellia** Blockade of 5-lipoxygenase, inhibition of leukotrienes and prostaglandins
» **Bromelain** Proteolytic enzyme activity for the reduction of fibrin deposits and tissue inflammation
» **Anthocyanins** Antioxidant effects and stabilisation of cell membranes and positive effects on the gut microbiome

Regeneration of tendon tissue

» ESWT induces cell proliferation and collagen synthesis
» Phytopharmaceuticals support regeneration by reducing catabolic enzymes and promoting anabolic signalling pathways and can positively influence the gut microbiome
» Synergistic effects promote faster healing and a reduction in degenerative processes

CONCLUSION AND OUTLOOK

The combination of ESWT and phytopharmaceutical therapy offers a promising approach to the treatment of inflammatory and degenerative diseases of the musculoskeletal system. While ESWT primarily acts via the nervous system, curcumin, boswellia, bromelain and anthocyanins specifically address biochemical inflammatory pathways. The combination of both forms of therapy could improve efficacy, reduce side effects and sustainably promote regeneration.

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INFORMATION MATERIAL

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HARNESSING THE POWER AND POTENTIAL OF "SELF-HEALING" FOR MUSCULOSKELETAL HEALTH

A New Approach in Sports and Exercise

PROF. ALI MOBASHERI, MD / UNIVERSITY OF OULU, FINLAND

When it comes to managing musculoskeletal pain - whether it's low back pain (LBP), osteoarthritis (OA), or post-workout soreness – our first instinct is often to reach for painkillers in the medications cupboard in the bathroom, or buy some over-the-counter from the local pharmacy, or consult Dr Google or a real medical professional.

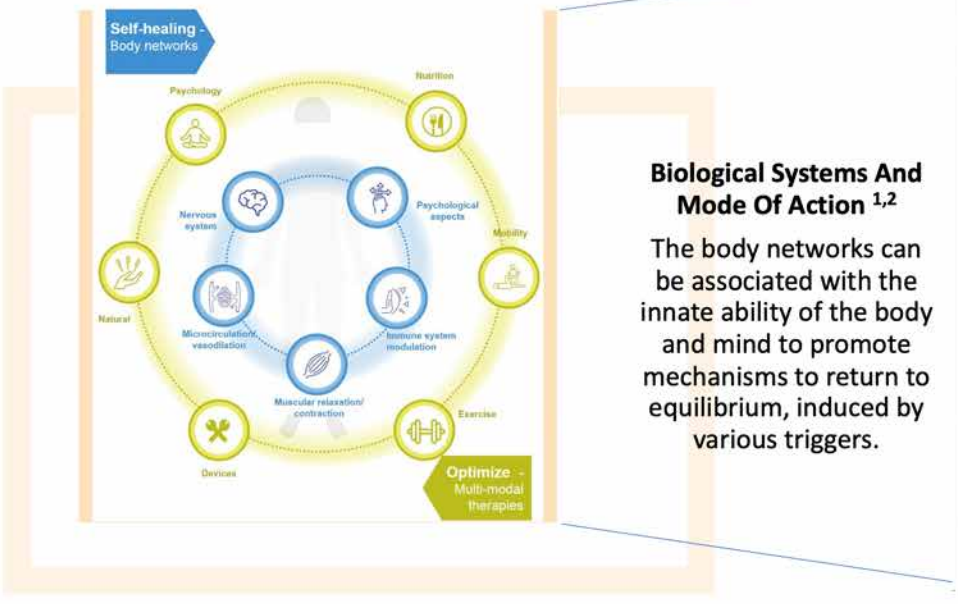
However, we have become too reliant on prescription medicines and over-the-counter painkillers. We desperately need alternative and drug-free solutions for pain management. But what if our bodies have an inheret and built-in capacity to heal without drugs? This concept of "self-healing" is gaining traction, and it's one that athletes and fitness enthusiasts should begin to pay serious attention to.

THE "SELF-HEALING" CONCEPT

Musculoskeletal (MSK) conditions, including LBP, OA and other forms of joint disease, affect millions of people globally and are leading causes of physical disability. Traditionally, treatments have focused on medications that relieve pain but often come with unwanted side effects. In contrast, "self-healing" shifts the focus to harnessing the body's own repair systems – working in harmony with the body, not just against symptoms, but in concert with physiological repair systems. "Self-healing" involves activating five key body networks: the nervous system, psychological mechanisms, immune response, microcirculation, and muscle function. By tapping into these networks, the body can naturally manage pain, heal tissues, and restore physiological balance.

INTEGRATING SELF-HEALING IN SPORTS AND PHYSICAL EXERCISE

For athletes and those leading an active lifestyle, understanding how to promote self-healing can potentially be a game-changer. Exercise, mental focus, and nutrition already play pivotal roles in muscle repair, but integrating self-healing strategies into your fitness routine



Biological Systems And Mode Of Action [1,2]

The body networks can be associated with the innate ability of the body and mind to promote mechanisms to return to equilibrium, induced by various triggers.

Adapted from McSwan J, et al. J Pain Res. 2021:14:2943-58.

Adapted from Mobasheri A. J Pain Res. 2022:15:3479-82

1. McSwan J, et al. J Pain Res. 2021;14:2943-58; 2. Mobasheri A. J Pain Res. 2022;15:3479-82.

can enhance recovery and prevent injury. Physical activity and improved circulation: Light, consistent exercise promotes blood flow, which carries oxygen and nutrients to tired and damaged tissues. Whether it's stretching, yoga, or light cardiovascular work, maintaining circulation is key to promoting the self-healing process. Relaxation and nervous system activation: Engaging in activities like meditation, breathing exercises, or simply taking a break can activate the parasympathetic nervous system (the "rest and digest" system), which fosters cellular repair and tissue recovery. This is particularly useful after intense training sessions.

Mind-body exercises: Techniques like cognitive-behavioral therapy (CBT), visualization, and mindfulness reduce stress hormones, such as cortisol, and pro-inflammatory mediators which are known contributors to musculoskeletal degeneration and pain. Mental stress often manifests as muscle tension, and addressing this link through psychological strategies can enhance physical healing. Natural remedies and diet: Nutrition is another critical aspect of self-healing. A balanced diet rich in anti-inflammatory foods – like fruits, vegetables, and healthy fats – supports immune function and muscle recovery. Additionally, supplements like omega-3s and curcumin have shown promise in reducing pain and inflammation.

A HOLISTIC SHIFT IN PAIN MANAGEMENT

For many years, MSK pain has been managed primarily through the use of prescription and over the counter pharmaceuticals, but the rise of self-healing suggests a broader, more integrative and multidisciplinary approach. Whether you're an athlete recovering from an injury or dealing with chronic pain from LBP or OA, understanding the interplay between physical, mental, and immune health can significantly affect your healing journey. There is increasing evidence to support the integration of multidisciplinary and multimodal management for MSK pain. This creates a unique opportunity for healthcare professionals to come together and collaborate for the benefit of patients with MSK pain.

In conclusion, "self-healing" is more than just a concept - it's a call to action to optimize your body's natural, inherent and physiological capabilities. By incorporating multimodal and multidisciplinary strategies such as mental relaxation, proper circulation, immune support, and holistic remedies, you can achieve a more sustainable recovery, improve your performance, and lead a pain-free, active lifestyle.

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READ FOR YOU BY AMR FARAG, MD

THE IMPACT OF PRAYER (SALAH) ON NON-CONTACT MUSCLE INJURIES OF THE LOWER LIMB IN PROFESSIONAL SOCCER PLAYERS

J Orthop Surg Res. 2020; 15: 440. doi: 10.1186/s13018-020-01955-5
Eduard Bezuglov, Oleg Talibov, Mikhail Butovskiy, Anastasiya Lyubushkina, Vladimir Khaitin, Artemii Lazarev, Evgeny Achkasov, Zbigniew Waśkiewicz, Thomas Rosemann, Pantelis T. Nikolaidis, Beat Knechtle and Nicola Maffulli

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Thirty-one to 41% of all injuries in soccer involve the muscles, with most occurring in the thigh. The hamstring muscles account for up to 37% of all muscle injuries in soccer players, a number on the increase. The second and third most prevalent injuries are the injuries of the adductor muscles of the hip and the quadriceps femoris muscle (23% and 19%, respectively). Muscle injuries in elite male football constitute to about a third of total time loss. Hamstring injuries are on the rise and now account for nearly one in every four injuries.

Age, previous history of injuries, imbalance between strength and flexibility, and decrease in both eccentric power and mobility all play an important role in non-contact muscle injury. Eccentric exercises aimed at hamstrings are currently considered the best method to prevent their injury. Most often, muscle injuries occur during eccentric contraction, and eccentric exercises should be included in training programs to prevent muscle injury. Some studies highlighted the association between lumbar and pelvic mobility and the frequency of hamstring injury.

Prayer (also called Salat and Namaz) is a traditional Muslim prayer. In traditional Islam, Salah is performed five times a day. Each Salah consists of a set of repeated movements called Rakats. Up to 48 Rakats may be performed daily, and at least 17 of them are mandatory. Rakat consists of a specific sequence of 7 to 9

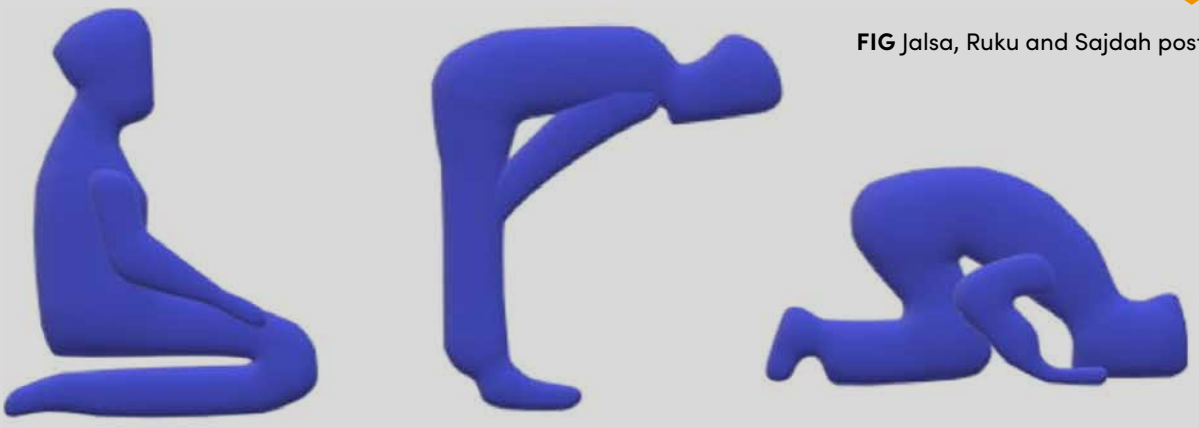

FIG Jalsa, Ruku and Sajdah postures

postures. Therefore, the overall number of postures taken when performing Salah cannot be less than 119 per day. Each of the nine postures has a specific duration, which varies from 3 – 4 to 40 – 60 s.

The regular practice of Salah may positively impact an individual's health, including the health of the musculoskeletal, cardiovascular, and nervous systems.

Sitting (Jalsa), Bowing (Ruku), and prostration (Sajdah) postures involve all the muscles of the lower limb and the lumbosacral spine, as well as all the large joints. Most of the movements in these postures involve eccentric loading of certain muscles of the lower limbs. The total time spent in these postures during the day is at least about 20 min.

Bowing posture strengthens the back and increases hip mobility and the mobility of the popliteus tendon. It reduces spinal, back, and neck stiffness and helps to improve body posture, balance, and coordination. Performing movements similar to Bowing positively affects the lower spine and body stability.

Sitting posture leads to the extension of the muscles of the shins and buttocks and to the maximum flexion of the knee joint. This and similar postures reinforce the core and muscles and the muscles of the lower back, an important factor in preventing the development of pain in this region. The regular performance of Salah by soccer players may affect their rate of muscle injuries.

The prevalence of non-contact muscle injuries, including hamstring injuries, were lower in soccer players who regularly perform prayer (Salah). Although the reasons for such finding is likely to be multifactorial, this could be attributed to eccentric lengthening of the muscles of the lower limbs during certain movements undertaken several times per day during prayers plays a major role.

You can find the bibliography at the article on www.sportaerztezeitung.com

COLLAGEN

The ingredient we will need for at least another 1 million years

MIGUEL FLORIDO, MD /
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The high prevalence of knee osteoarthritis and other joint pathologies of the lower limbs is a growing concern in modern medicine. According to recent studies, it is estimated that up to 43% of asymptomatic adults over 40 years of age show signs of knee osteoarthritis on MRI images [1].

This condition not only impacts patients' quality of life through limited mobility and the development of comorbidities, but is also associated with increased use of analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), which can lead to long-term adverse effects contributing to a considerable impact on health.

THE ROLE OF CHONDROPROTECTORS IN TODAY'S MEDICINE

To counteract the effects of joint wear and tear and improve patients' quality of life, chondroprotectors such as SYSADOA (synthetic and natural substances for cartilage protection) play a key role in today's medicine. These products help to reduce pain and inflammation, improving mobility without resorting to pain-killers, NSAIDs and opioids. Among the most effective and highly rated chondroprotectants in the field of nutrition and medicine, collagen supplements stand out as a preferred therapeutic option for both clinicians and consumers. However, not all collagens are the same and an in-depth analysis is needed to understand their function and potential health benefits.

THE DIFFERENT TYPES OF COLLAGEN ON THE NUTRACEUTICAL MARKET

Collagen is an essential protein for the structure of our bones, skin, tendons and cartilage. In the supplement market, there are different types of collagen, each with specific characteristics and health benefits. The most common types are listed below:

Collagen type I

Type I collagen is the most abundant form of collagen in the human body and is essential for the structure of various connective tissues, especially in skin, bones, tendons and ligaments. Composed of densely organised fibres, this collagen offers high tensile strength, enabling it to provide integrity and elasticity to the tissues that make up the structure of the body.

Several clinical studies have validated its efficacy, especially in improving skin elasticity and hydration. A clinical trial published in *Skin Pharmacology and Physiology* (2014) [3] showed that supplementation with hydrolysed type I collagen significantly increased skin elasticity and hydration in women aged 35 – 55 years. The results showed that, after 8 weeks of treatment, participants experienced a marked improvement in firmness and wrinkle reduction, results that are confirmed by another study in *The Journal of Medical Nutrition & Nutraceuticals* (2015) [4] including data on improved skin regeneration, especially when consumed as part of nutritional supplements.

Although there is literature supporting the use of type I collagen for the improvement of osteoarticular health and recovery of tendon and ligament injuries, these findings are not as significant, showing less potency than studies with other types of collagen, such as type II collagen.

Collagen Type II

Type II collagen is the main structural protein in articular cartilage, constituting approximately 90 % of the collagen present in this structure. Its primary function is to provide the elasticity and strength necessary to maintain the integrity of cartilage, allowing for proper joint mobility and functional performance. As we age, or due to factors such as injury or degenerative diseases, the body's ability to synthesise type II collagen decreases, leading to wear and tear and degeneration of articular cartilage. This phenomenon is mainly associated with pathologies such as osteoarthritis, where type II collagen is affected in the joint, causing pain, stiffness and loss of mobility.

THE SUCCESS OF TYPE II COLLAGEN IN THE GLOBAL MARKETPLACE

Collagen type II enjoys great popularity among professionals and consumers and has experienced significant growth in the supplementation sector. In 2021, the global collagen supplement market reached a value of approximately $4.1 billion, and is expected to grow at a compound annual growth rate (CAGR) of 8.4 % through 2030, driven largely by type II collagen, especially in the form of supplements targeting joint health [5]. This success is due to its efficacy in treating joint problems, backed by scientific studies showing its ability to improve flexibility and reduce joint pain. However, despite its popularity, conventional type II collagen has certain drawbacks.

CHALLENGES OF CONVENTIONAL COLLAGEN TYPE II

One of the main challenges with conventional type II collagen is the large amount needed to obtain significant therapeutic benefits. Type II collagen supplements, usually manufactured in powder form, must be consumed in high doses (2.5 to 15 grams daily) and are effective but impractical. In addition, these products are often marketed with astringent textures and flavours that are not always well received, resulting in uncomfortable modes of use for consumers that affect adherence to treatment and, therefore, long-term maintenance.

UNDENATURED TYPE II COLLAGEN: THE BREAKTHROUGH REVOLUTIONISING JOINT HEALTH

Fortunately, the development of non-denatured type II collagens has solved some of these problems, offering a more potent and practical alternative. Non-denatured type II collagen, such as UC-II®, keeps its triple helix structure intact, allowing it to retain its active epitopes. These epitopes are biologically active regions that interact with the immune system, promoting a process called oral tolerance. This unique immune mechanism regulates the body's immune response, helping to regenerate joint cartilage and reduce inflammation without the side effects that can occur with other treatments. Oral tolerance also allows benefits to be achieved at much lower doses than those required for conventional hydrolysed type II collagen.

CLINICAL STUDIES SUPPORTING UC-II® EFFICACY

Several clinical studies have shown that undenatured type II collagen is significantly more effective in improving joint flexibility and cartilage regeneration than conventional versions of type II collagen. In a study published in *The Journal of Clinical Trials* (2013) [6], UC-II® was found to improve joint flexibility and reduce knee pain at a dose of only 40 mg daily, 15 times more effective than placebo. These findings are reinforced by another publication in the *BMC Nutrition Journal* [7], which found very significant symptomatic improvement in patients with knee osteoarthritis at the same dose of 40 mg. This contrasts with conventional type II collagen supplements, which require much higher doses to achieve similar results. In addition,

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UC-II® has proven to be more versatile in formulation, allowing it to be easily integrated into capsules and other easy-to-consume formats, which improves patients‘ adherence to treatment and long-term maintenance, a determining factor in the course of chronic degenerative pathologies.

Undenatured type II collagen represents a significant advance in the collagen category due to a unique mechanism of action, improved effectiveness at lower doses, as well as versatility and greater ability to be combined with other nutraceutical ingredients and presented in other more popular formats with better therapeutic adherence, such as capsules. Ongoing clinical research into this new type of collagen places it at the forefront of joint health, standing out among all collagens and the best natural ingredients in the segment.

Collagen Type III

Type III collagen is one of the most important components of connective tissue, present mainly in muscles, blood vessels and organs. It is often found in combination with type I collagen in elastic and structural tissues, and plays a key role in soft tissue repair and regeneration. This type of collagen is particularly relevant in improving tissue elasticity and strength, and is crucial in the response to injury.

Regarding the clinical benefits of type III collagen, a study published in *The Journal of Clinical Investigation* (2015) [8] showed that supplementation with type III collagen, in combination with type I collagen, contributes to improved function and regeneration of tendons and ligaments. The results indicated an improvement in soft tissue recovery and an increase in muscle and tendon flexibility and endurance in patients who had suffered sports injuries or joint wear and tear. This study supported the idea that type III collagen is essential for maintaining the integrity of connective tissues and speeding recovery after injury.

Another study in *The Journal of Clinical Investigation* (2018) [9] assessed the effects of type III collagen on vascular health, showing that its presence is essential for maintaining the elasticity of arteries.

These findings highlight the impact of type III collagen on the overall health of connective tissues, including blood vessels, and evidence of a more modest role in joint health compared to the effectiveness of other types of collagen, such as type II, demonstrated in a wider scientific literature.

Read more about Collagen type IV, V and X in the full online article www.sportaerztezeitung.com

In summary, the different types of collagen play essential roles in the health and functionality of our connective tissues, each specialising in key areas of the body. While type I collagen has been primarily focused on dermo-cosmetic

TAB. 1 Types of collagen. Health benefits based on clinical results

Collagen	Location	Clinically proven benefits	Scientific quality	Commercialisation (Yes or No)
Type I	Skin, bones, tendons, ligaments	Improved elasticity, bone strength, tendon and ligament regeneration	5	Yes
Type II	Joint cartilage	Joint health, cartilage regeneration, pain reduction and improved mobility	5	Yes
Type III	Muscles, blood vessels, organs	Improved elasticity and regeneration of soft tissues, vascular health	4	Yes
Type IV	Basal membranes (kidneys, lungs, blood vessels)	Kidney filtration, healthy basement membranes and blood vessel function	3	No
Type V	Placenta, cornea, connective tissue	Cellular regeneration, organ health, helps in the formation of collagen fibres	3	No
Type X	Articular cartilage, bone	Cartilage regeneration, bone formation, joint repairs	2	No

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and nutricosmetic use due to its special role in the dermis and more significant clinical results in the dermatological and aesthetic area, type II collagen leads the way in joint health care compared to other types of collagen, backed by long experience of use and market validation over the last decade, and still retains a surprising intention to grow in sales worldwide in the coming years. This commercial success has been accompanied by a great scientific investment that far exceeds the clinical trials carried out with other types of collagens, in addition to the undisputed prominence of non-denatured type II collagens since their inception, whose studies have shown higher rates of effectiveness with much lower doses and providing advantages that have resolved the potential discussions surrounding the predilection of other types of collagens for the prevention and treatment of osteoarticular pathologies. Collagens type III, IV, V and X, although they show well-studied functions within the organism, have fewer publications.

COLLAGEN FOR 1 MILLION MORE YEARS

From the first Australopithecus to the years have passed, a period in which evolution has forged a truly exceptional organism, capable of adapting to almost any condition in both natural and urban environments. However, this long evolutionary process, full of astonishing advances, has not been perfect. Despite our body's extraordinary capabilities, we continue to struggle with weaknesses left behind along the way, one of the most prominent being the fragility of our joints under gravity, body weight and standing. While our species has managed to overcome many adversities, it is likely that we will need at least another million years of evolution to develop joints that are truly resistant to these new challenges, a process during which prominent ingredients such as collagen will be excellent travelling companions that protect our joints to keep us more active, therefore longer-lived and with a higher quality of life.

FURTHER READING TIPS FROM THE EDITORS

COLLAGEN IN SPORTS

Collagens are structural proteins used in sports for the prevention and treatment of osteoarthritis. They are often taken orally in the form of dietary supplements or foods rich in collagen. There are 28 different types of collagen, of which type II is particularly relevant in the treatment of osteoarthritis. Despite a lack of comprehensive data, some studies suggest that collagen supplements may alleviate symptoms. The body's own collagen synthesis decreases with age, which increases the risk of osteoarthritis.

Prof. Nadine Berling & Ronny Heldt-Döpel – APOLLON University of Applied Sciences, Bremen

ORTHOBIOLOGICS IN SPORTS MEDICINE COLLAGEN

Orthobiologics offer innovative solutions in sports medicine, in particular collagen, which is already showing positive results in the treatment of knee osteoarthritis. In a recent RCT, hydrolysed collagen peptides led to pain relief and improved functionality compared to conventional treatments. The study highlights the minimally invasive benefits and 'manageable' costs of orthobiologics compared to surgical therapies. In addition, such treatments could avoid the side effects of corticosteroid injections.

Prof. Philip Catalá-Lehnen, MD Groß Catharina, M.Sc. Andreas Kuhrau, MD

Read the full article with an interesting case report: "Knee – Cartilage Damage" (The patient received an intra-articular injection of Arthrys® 5 mg / 2 ml.) at: https://sportaerztezeitung.com/rubriken/therapie/17354/collagen-co/

EDUCATIONAL VIDEO: CELLULAR MECHANISMS OF REGENERATIVE PROCEDURES

Dr Christoph Schmitz, MD

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*Source: Cortet, B., Lombion, S., Naissant B. et al. Non-Inferiority of a Single Injection of Sodium Hyaluronate Plus Sorbitol to Hylan G-F20: A 6-Month Randomized Controlled Trial. Advances in Therapy 38, 2271-2283 (2021).

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HOLISTIC ORAL HEALTH: THE COMBINATION OF GUIDED BIOFILM THERAPY (GBT)® AND NATURAL ANTI-INFLAMMATORY THERAPY

Inflammatory conditions of the oral cavity, such as gingivitis and periodontitis, are widespread and can lead to tooth loss in the long term. In addition to professional tooth cleaning, natural anti-inflammatory substances such as anthocyanins, boswellia, turmeric and bromelain are becoming increasingly important. Thanks to their anti-inflammatory, antioxidant and antibacterial properties, they can promote oral health and support the healing of gum disease.

NATURAL ANTI-INFLAMMATORIES IN THE ORAL CAVITY: ANTHOCYANINS, BOSWELLIA, TURMERIC AND BROMELAIN

Inflammatory conditions of the oral cavity, particularly gingivitis and periodontitis, are caused by bacterial infection and immunological reactions. Natural active ingredients such as anthocyanins, boswellia, turmeric and bromelain show promising anti-inflammatory, antioxidant and antibacterial properties that could offer a complementary treatment strategy.

ANTHOCYANINS

Strong antioxidants with anti-inflammatory properties

Anthocyanins belong to the group of flavonoids and are found in dark-coloured fruits such as blueberries, blackcurrants, grapes and red cabbage. They have a dual protective function:

Mechanisms of Action

- Antioxidant effect: anthocyanins neutralise free radicals and reduce oxidative stress, which plays a significant role in inflammatory processes in the gums [1].
- Inhibition of pro-inflammatory enzymes: They block cyclooxygenase (COX) and lipoxygenase (LOX), which are involved in the synthesis of pro-inflammatory prostaglandins [2].
- Inhibition of pro-inflammatory enzymes: They block cyclooxygenase (COX) and lipoxygenase (LOX), which are involved in the synthesis of pro-inflammatory prostaglandins [2].
- Promoting wound healing: By modulating inflammatory signalling pathways, anthocyanins can contribute to gum regeneration [4].

Blueberries instead of tooth cleaning

It was shown that a daily intake of 500 g of blueberries can significantly reduce gingivitis. Remarkably, the observed reduction in gingival bleeding was even greater than the effect of professional tooth cleaning and could no longer be explained by the 'Hawthorne effect'. These results indicate that blueberries have pronounced anti-inflammatory properties that can significantly improve oral health, either alone or in combination with other oral hygiene measures.

Widén C. et al. (2015) Consumption of bilberries controls gingival inflammation. Int J Mol Sci.

BOSWELLIA (FRANKINCENSE)

Inhibition of Inflammatory Mediators

Boswellic acids are the active ingredients of frankincense (Boswellia serrata), which regulate inflammatory processes through various mechanisms.

Mechanisms of Action

- Inhibition of 5-lipoxygenase (5-LOX): This inhibits the production of leukotrienes, which play a central role in the inflammation of the oral mucosa [5].
- Blocking prostaglandin E2 (PGE2): Boswellia acids inhibit the synthesis of this messenger substance, which is involved in pain and inflammatory reactions [6].
- Antibacterial effect: incense is effective against oral pathogens such as Streptococcus mutans and Fusobacterium nucleatum [7].
- Promotes wound healing: The anti-inflammatory properties contribute to the regeneration of damaged tissue [8].

TURMERIC (CURCUMIN)

Natural anti-inflammatory and antiseptic

Curcumin, the main active ingredient in turmeric (Curcuma longa), has strong anti-inflammatory and antibacterial properties.

In a comprehensive review, it has already been shown on the basis of selected animal studies and randomised clinical studies that turmeric can reduce the following dental parameters: gum pocket depth, periodontal pathogens, plaque and bleeding indices, and redness.

Forouzanfar F, et al. (2020) Curcumin for the Management of Periodontal Diseases: A Review. Curr Pharm Des.

Mechanisms of Action

- Inhibition of the NF-κB signalling pathway: This suppresses pro-inflammatory cytokines such as TNF-α and IL-6, which are responsible for periodontitis [9].
- Antibacterial effect: Curcumin inhibits the growth of pathogenic bacteria in the oral cavity, including P. gingivalis and T. denticola [10].
- Promotes tissue regeneration: Studies show that curcumin stimulates collagen production, thus improving gum healing [11].

» Reducing dental plaque:
Studies have shown that mouthwashes containing curcumin have a comparable effect to chlorhexidine, but without the side effects such as tooth discolouration [12].

BROMELAIN

Enzymatic support for wound healing

Bromelain is a proteolytic enzyme found in pineapples that has anti-inflammatory, decongestant and woundhealing properties.

Mechanisms of Action

» Proteolytic effect: Bromelain breaks down inflammatory protein deposits and thus promotes healing [13].
» Improvement of blood circulation: It reduces swelling and increases microcirculation, which accelerates the removal of inflammatory substances [14].
» Antithrombotic properties: Bromelain dissolves fibrin clots, which can occur, for example, after dental surgery or inflammation [15].
» Analgesic effect: It inhibits pain-mediating substances such as bradykinin [16].

These agents provide scientifically based support for oral health and could be effective adjuncts to conventional periodontal therapy.

Integration of natural active ingredients into a GBT protocol

Guided Biofilm Therapy (GBT) from EMS is a scientifically based, minimally invasive protocol for professional tooth cleaning that effectively removes biofilm and tartar. In combination with anti-inflammatory therapy, it offers an innovative approach to sustainable oral health.

» **Diagnosis & education**
Examination for inflammation and recommendation of an anti-inflammatory diet.
» **Staining of the biofilm**
Visualisation for targeted cleaning, control of inflammatory areas.
» **Patient instruction**
Tips for oral hygiene, integration of anthocyanins, boswellia, turmeric and bromelain, among other things, into the diet.
» **Airflow® cleaning**
Removal of biofilm with gentle powder jet technology, supported by anti-inflammatory agents.
» **Perioflow® treatment**
Cleaning of deep periodontal pockets, supplemented by boswellia to reduce inflammation.
» **Piezon® PS ultrasound**
Removal of calculus, while bromelain wound healing and blood flow.
» **Re-evaluation**
Checking gum health and the effect of anti-inflammatory measures.
» **Recall & aftercare**
Regular GBT sessions and continuous support from anti-inflammatory substances.

Benefits of combining GBT with anti-inflammatory therapy

» **Effective biofilm removal**
Minimises the main cause of gum inflammation.
» **Natural anti-inflammatory action**
Supports the healing process with herbal ingredients.
» **Gentle and painless**
Reduces discomfort and improves tolerability.
» **Long-term oral health**
Strengthens the gums and prevents periodontitis.
» **Scientifically based synergy**
Combines modern dentistry with natural healing methods.

CONCLUSION

The combination of Guided Biofilm Therapy and targeted anti-inflammatory therapy offers a holistic solution for promoting oral health. While GBT optimises the mechanical removal of biofilm and tartar, natural active ingredients have an anti-inflammatory effect and promote regeneration. This approach could enable gentle but effective prevention and treatment of gum disease – with the potential to contribute to long-term oral health.

THE PROTEIN PLUS

Proteins and periodontal disease

Proteins also have a positive effect on periodontal health. Studies have shown an inverse correlation between protein intake and the incidence of periodontitis [17, 18]. The gingival tissue has one of the highest turnover rates in the body, and proteins are crucial for its structural maintenance. Severe protein deficiency results in tooth loss and periodontal lesions [19]. Insufficient protein intake negatively impacts the immune system, wound healing and the antibacterial properties of saliva [20].

The bibliography can be found in the article at www.sportaerztezeitung.com

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Dr Roßberg is a founding member of the D-A-CH Society for Nutritional Dentistry (DGEZM).

INTRA-ARTICULAR TREATMENT IN THE CONTEXT OF ORTHOBIOLOGICAL THERAPY CONCEPTS

overview of hylauronic acid products

PROF. PHILIP CATALÁ-LEHNEN, MD,
PHD CAND. CATHARINA GROß, MSC / LANS MEDICUM HAMBURG
ANDREAS KUHRAU, MD

The prevalence of osteoarthritis is increasing, necessitating further development and optimization of conservative, multimodal therapy concepts. In this context, hyaluronic acid (HA) products have become established in everyday orthopedic practice and sports medicine. Despite ongoing debates on the effectiveness of intra-articularly administered HA (IA-HA), the market for viscosupplements (VS) is steadily growing. In 2021, the market was valued at $4.4 billion, with a forecasted growth to $10.9 billion by 2031, underscoring the increasing demand and potential in this field [1]. New combinations of active ingredients and product innovations are driving market and result in numerous scientific publications [2].

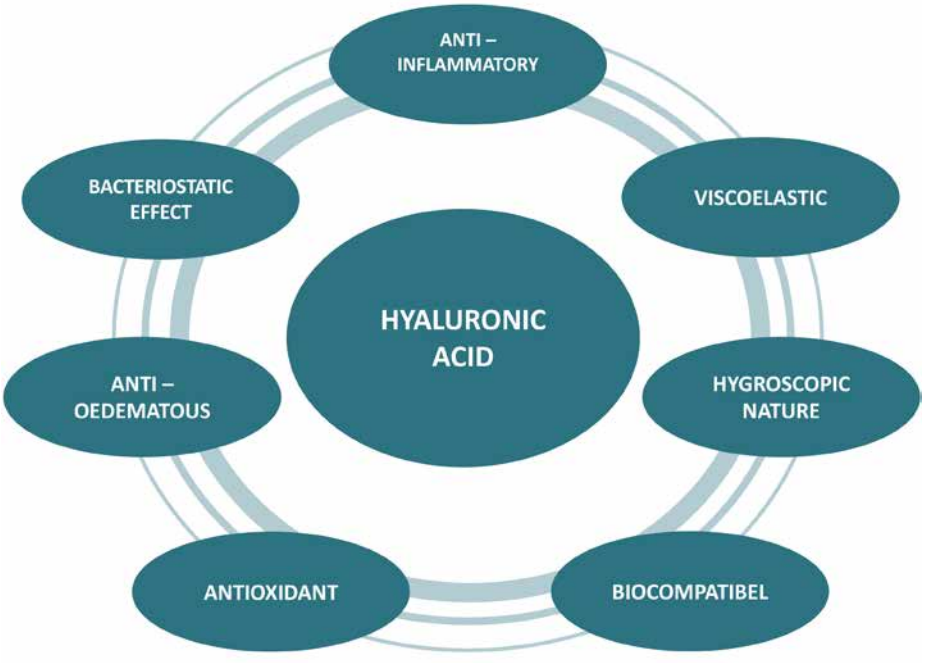


FIG. 1 Properties of HA (following [15])

PREVALENCE OF OSTEOARTHRITIS

In 2020, approximately 595 million people worldwide – about 7.6 % of the total population – were affected by osteoarthritis. A forecast published in the Lancet (2023) estimates that if current trends continue, around 1 trillion people worldwide could be affected by osteoarthritis by 2050 [3] due to demographic change [4].

The knee is the most affected joint. The age-standardized prevalence of knee osteoarthritis (KOA) in 2020 was around 4,307 cases per 100,000 people worldwide. Symptomatic KOA often leads to severe pain, limited mobility and significant limitations in quality of life due to reduced independence in everyday activities [5, 6].

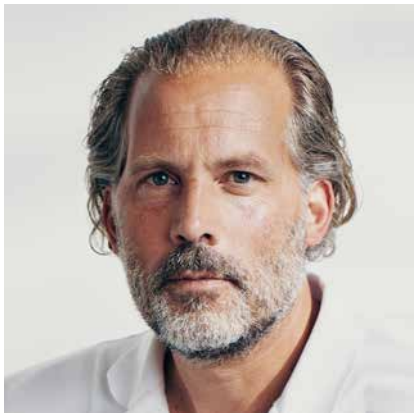
Given the high socio-economic burden of musculoskeletal diseases, the World Health Organization (WHO) launched the Bone and Joint Decade to improve research and address the growing challenges in the healthcare system [4].

Currently, the treatment of OA primarily focuses on symptom control. The development of disease-modifying osteoarthritis drugs is complicated by factors such as the complexity of the disease and the heterogeneity of patient populations. Nevertheless, promising results are being observed in clinical trials involving new combinations of active ingredients targeting cartilage repair, cellular senescence, and homeostasis [7].

TABLE 1 HYALURONIC ACID PRODUCTS (Catalá-Lehnen et al., 2025)

STRUCTURE CATEGORY	PRODUCT	STRUCTURE			DOSAGE (mg/ml)	MOLECULAR-WEIGHT (kDa)	ORIGIN		NO. OF INJECTIONS
		Linear	Cross-linked	Combination			Fermented	Avian	
Linear products	Euflexxa®	X			20mg/2ml	2400–3600	X		3
	Go-on®	X			25mg/2,5ml	800–1500	X		3 – 5
	Go-on matrix®	X			20mg/2ml	2000	X		3
	HYA-Ject®	X			10mg/2ml	1500–2100	X		3 – 5
	HYA-Ject mini®	X			10mg/1ml	1000–2000	X		1 – 3
	HYA-Ject plus®	X			20mg/2ml	1000–2000	X		1 – 3
	Hyalart®	X			20mg/2ml	500–730		X	5
	HyalOne®	X			60mg/4ml	1500–2000	X		1
	Hyalubrix®	X			30mg/2ml	1500–2000	X		3 – 5
	Orthovisc	X			30mg/2ml	1800	X		3
	Ostenil®	X			20mg/2ml	1000–2000	X		3 – 5
	Ostenil® mini	X			10mg/1ml	1000–2000	X		1 – 3
	Recosyn® / Synochrom®	X			10mg/2ml	1600	X		1 – 5
	Recosyn® m.d. N	X			10mg/1ml	1600	X		1 – 5
	Recosyn® Uno ultra	X			120mg/4,8ml	2200	X		1
	Sinovial® 16	X			16mg/2ml	800–1200	X		3 – 5
	Sinovial® Forte	X			32mg/ml	800–1200	X		3 – 5
	Suplasyn®	X			20mg/2ml	500–730	X		3 – 5
	Suplasyn® 1-Shot	X			60mg/6ml	500–730	X		3 – 5
Linear + products	Hymovis HYADD®4	X +		HYADD4®	24mg/3ml	500–730	X		2
	Hymovis ONE®	X +		HYADD4®	32mg/4ml	500–730	X		1
	HYA-Ject® plus	X +		Mannitol	40mg/2ml	1500–2100	X		1 – 3
	Ostenil® plus	X +		Mannitol	40mg/2ml	1000–2000	X		1 – 3
	Recosyn® Max forte N	X +		Niaciamid	44mg/2ml	1200–2000	X		1 – 5
	Synolis VA 40/80	X +		Sorbitol 80mg	40mg/2ml	2000	X		1 – 3
	Synolis VA 80/160	X +		Sorbitol 160mg	80mg/4ml	2000	X		1
Cross-linked products	Monovisc		X		88mg/4ml	2500	X		1
	Recosyn® forte N		X		44mg/2ml	1700	X		3
	Synvisc®		X		16mg/2ml	6000		X	3
	Synvisc One®		X		48mg/6ml	6000		X	1
Cross-linked + products	Durolane®		X	NASHA®	60mg/3ml	10000	X		1
	Cingal®		X +	Triamcinolone hexacetonide	88mg; 18mg/4ml	1000–2900	X		1
Hybrid products	RenehaVis®	X		HMW-HA + LMW-HA	1,4ml	580–780; 1200–2000	X		2
	Sinogel®			HMW-HA + Chondroitin	72mg; 48mg/3ml	1400–2100	X		1
	Sinovial® HL64			HMW-HA + LMW-HA	32mg; 32mg/2ml	80–100; 1400–2100	X		1 – 3

PROF. PHILIP CATALÁ-LEHNEN, MD



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CURRENT RECOMMENDATIONS

The efficacy of IA-HA remains controversial in scientific literature and requires a differentiated consideration of the existing evidence. International clinical guidelines differ considerably regarding the recommendations for IA-HA use in KOA [8].

A recent review of 'current clinical practice guidelines' indicates that IA-HA is widely part of the treatment management of KOA in global guidelines [9].

Based on the results of a 'Delphi consensus process', an expert panel of the EUROVISCO group published consensus guidelines for IA-HA in KOA in 2024. The resulting 34 statements include for instance strong recommendations for IA-HA injections [10], can serving as a valuable resource for clinicians developing individualized treatment algorithms.

The German Society for Orthopedics and Trauma Surgery (DGOU) is expected to publish the S3 guideline "Prevention and treatment of osteoarthritis of the knee" shortly. Until then, the recommendations will continue to be based on the S2k guideline 'Osteoarthritis of the knee', which makes the open recommendation "can be considered" for IA-HA.

When selecting a VS, the cost-effectiveness of hyaluronic acid products should also be taken into account, considering factors like biochemical composition, combinations of active ingredients, and different patient populations [2].

Regarding pain outcomes, a network meta-analysis following IA-HA application indicated a minimal clinically important difference (MCID) and an effect size of 0.34 – 0.63 (modest / moderate effects), showing better results than in control groups treated with corticosteroids and paracetamol [11]. However, other systematic evidence suggests only a slight reduction in pain following IA-HA treatment, leading to concerns about clinical significance [12]. Short-term pain relief after IA-HA was shown in a systematic review of RCTs published in 2024 [13]. A literature analysis from 2024 presents varying data on effect sizes and describes indications of publication bias [14]. Given these findings, clinical relevance should be critically assessed and treatment recommendations individually discussed with the patients.

PROPERTIES OF HYALURONIC ACID AND PREDICTORS OF RESPONSE

To enhance the effectiveness of IA-HA injections, it is important to consider several predictors of response, including the stage of disease, age, body mass index, comorbidities and radiological findings [10].

PRODUCT OVERVIEW

Table 1 provides an overview of different HA products (based on the manufacturer's specifications) for IA use, specifically used in sports medicine to help healthcare professionals select the most appropriate product.

The products are categorized based on their structure and formulation, which includes linear HA, cross-linked HA, and combination types. Each product is categorized by its dosage (mg / ml) in kDa, reflecting the molecular weight of the HA. The origin of the HA is noted, distinguishing between fermented and avian sources, influencing the product's properties and suitability for different treatments and populations (e. g., regarding intolerances).

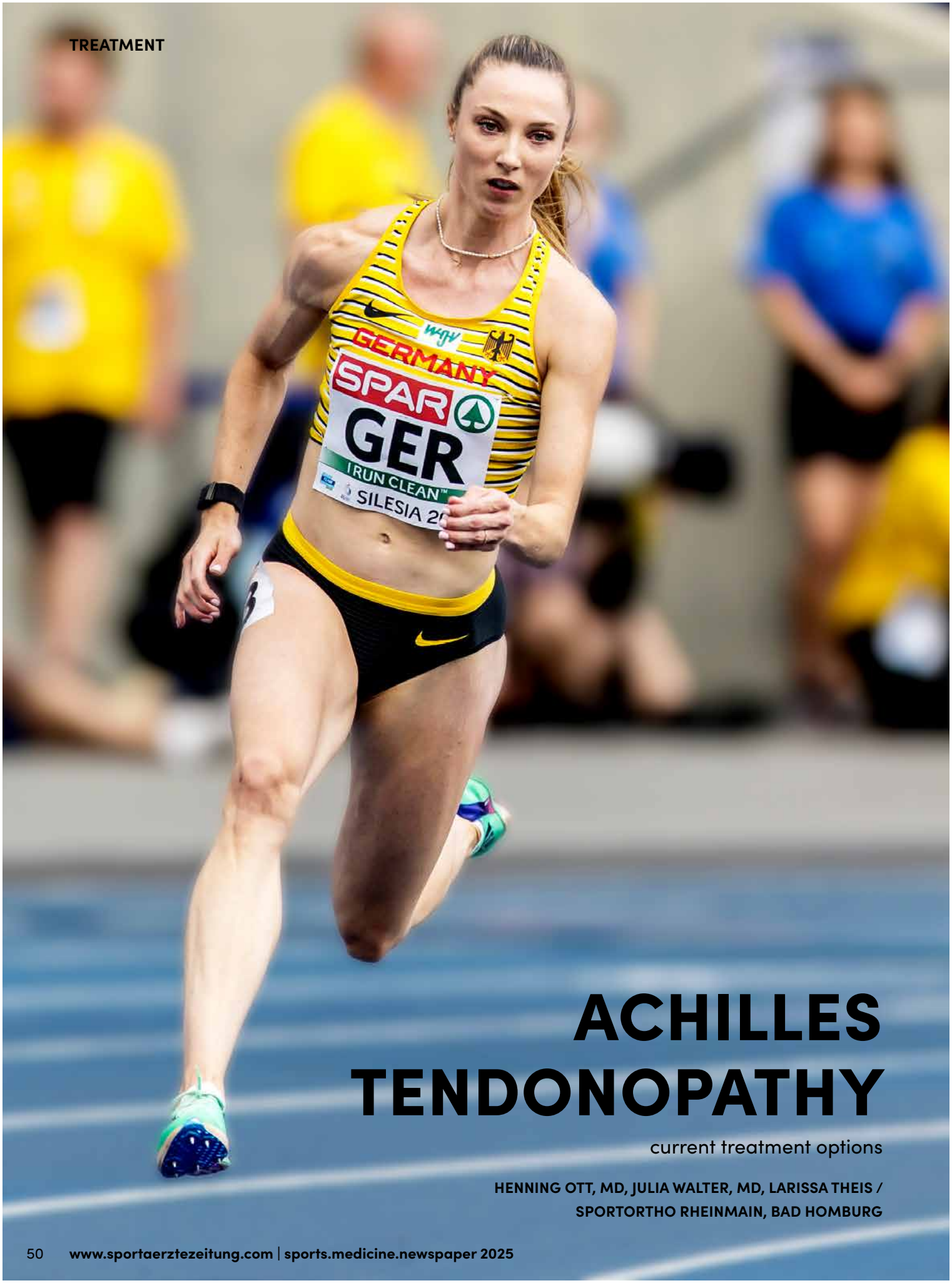
Given HA's slow-release properties, it is recommended to combine it with supportive components or agents. Currently available combination products can be found in Table 1 (Structure – Combination).

SUMMARY

IA-HA is an important component of a multimodal approach to OA management [10]. When selecting a product for IA injection, it is crucial to recognize the differences among available products. Further development and optimization of treatment algorithms incorporating orthobiological therapy options (such as PRP, collagen, ACS) are necessary to ensure safe and efficient patient treatment. The following goals should be focused on to advance treatment algorithms in sports medicine:

- Improvement of clinical outcomes.
- Improvement of clinical efficacy through innovative combinations of DMOADs active ingredients – product developments.
- Optimization of the indication-specific use of HA preparations (differences in active ingredient combinations...) in orthobiological treatment algorithms.
- Review of the necessity for research to address current study limitations and to avoid "research waste".

The bibliography can be found with the article at www.sportaerztezeitung.com



ACHILLES TENDONOPATHY

current treatment options

HENNING OTT, MD, JULIA WALTER, MD, LARISSA THEIS /
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In the case of AT, various entities can be clearly distinguished from one another, since these sometimes differ significantly in both pathogenesis and therapy:

» Midportion tendinopathy (MPT): typical thickening, usually pressure-dolent, in the middle third of the tendon, usually between 3 – 5 (–7) cm proximal to the insertion.
» Insertional tendinopathy (IT): between 0–3 cm proximal to the insertion. Often associated with Haglund exostosis.
» Insertional intratendinous calcifications (IV): deep distal at the calcaneal insertion, often asymptomatic.
» Special forms include, for example, medication-associated tendinopathies. These are usually caused by treatment with corticoids or the use of fluoroquinolone antibiotics.

CAUSES

While biomechanical and functional causes must always be sought to explain the pathogenesis of MPT, IT is often additionally caused by a primary mechanical factor in the presence of Haglund exostosis. This leads to impingement with the Achilles tendon in dorsiflexion in the ankle and can lead to circumscribed ventral partial lesions at the calcaneal insertion.

In addition, runners must be careful to wear running shoes that fit their feet / foot position to avoid tilting in the hindfoot, which can lead to shear forces on the Achilles tendon. Tendonopathies also occur more frequently in patients with diabetes, renal insufficiency, obesity or high uric acid levels. Likewise, the use of corticosteroids, statins and fluoroquinolone antibiotics (FQ) should be enquired about, as these can lead to spontaneous ruptures of the Achilles tendon [4].

DIAGNOSTICS

» Clinical examination / functional testing
» Sonography incl. colour Doppler
» MRI
» X-ray calcaneus lateral
» Treadmill analysis / foot pressure measurement
» Electromyography (EMG)
» Elastrography

In recent years, EMG has become increasingly important as it offers the possibility of identifying control disorders of the musculature (Fig. 1), developing EMG-controlled individualised exercises for patients and, in difficult cases, conducting biofeedback training.

THERAPY

At the beginning of therapy, the severity of the clinical symptoms and the results of the imaging determine whether athletes can initially be left with a reduction in training volume or a reduction in the load on the Achilles tendon, or whether a break from sport is necessary. The basic therapy in all cases is the elimination of biomechanical risk factors and incorrect loading by means of functional training. Existing foot misalignments / tilting of the hindfoot should be

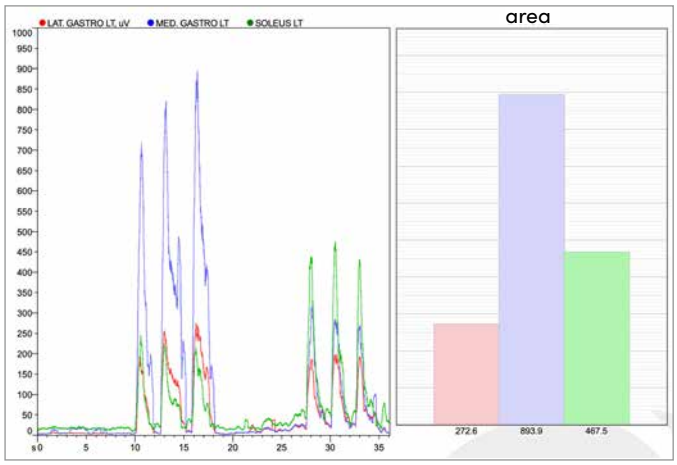

FIG. 1 28-year-old female long jumper with significantly different activation between the medial gastrocnemius head (blue) and the lateral portion (red); soleus muscle (green)

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compensated for with insoles if necessary. Manual mobilisation of the foot and ankle plays an important role alongside the classic therapeutic procedures on the tendon itself. Care should be taken to ensure that the ankle is as mobile as possible. For example, a 3.5-fold increase in the likelihood of developing Achilles tendon tendinopathy has been observed in patients with ankle dorsiflexion of less than 11.5° [5]. Other risk factors include reduced plantar flexion strength and hypomobility in the talonavicular joint. The knee-to-wall test is a simple and valid tool for an orienting examination.

Nutrition

From a nutritional point of view, it is recommended to reduce or avoid purine-rich / uric acid-increasing foods (especially meat and offal). An adequate intake of omega-3 fatty acids is important. The anthocyanin contained in cherries (mainly Montmorency sour cherries) has an anti-inflammatory effect, reduces oxidative stress and lowers uric acid levels. The celabin A contained in curcumin upregulates the transcription factor scleraxis [6]. This in turn promotes the proliferation of tenocytes and thus collagen I synthesis and the formation of the extracellular matrix. Incense (Boswellia), which is often found in food supplements together with curcumin, has a similar effect. Bromelain stimulates, among other things, the formation of new tenocytes.

Eccentric training (ET)

A well-known and effective form of training is ET with 3 x 15 repetitions twice a day over a period of 8 – 12 weeks. It should be ensured that the exercises are performed with both the knee extended (M. gastrocnemius) and with the knee bent (M. soleus). If IT is present, these exercises should only be performed up to the neutral position of the ankle to avoid impingement of the Haglund's deformity, which is usually present. Good results were then seen in

FIG. 2 Cortisone-induced Achilles tendon rupture with atrophic retracted tendon stumps

67 % of cases, while improvement only occurred in 28 %–32% when training was extended into dorsiflexion [7]. However, current data show that PTLEs (Progressive Tendon Loading Exercises) are sometimes more effective than pure ET and can therefore be recommended as initial conservative therapy [8]. Although Cook and Rio's 4-stage progressive loading protocol [9] was originally developed for tendinopathy of the patellar tendon, it can also be used to treat AT when adapted to the Achilles tendon.

Extracorporeal shock wave therapy (ESWT)

ESWT is now used almost universally in the treatment of Achilles tendinopathy. Korakasis et al. [10] were able to show that the effect of conservative therapy in combination with ESWT is better in the short, medium and long term than without it. Other studies also show that ESWT alone, without adequate basic therapy, is of no benefit. Both radial and focused shock waves have been shown to produce good results on the tendon itself. However, it has also been shown that ESWT does not lead to any improvement in symptoms in IT compared to eccentric training alone [1, 11].

Infiltration

Infiltration of the Achilles tendon with hyaluronic acid (HA), PRP or substances such as Traumeel®, embedded in a differentiated treatment concept, show good results. For example, for peritendinous infiltration of the Achilles tendon with hyaluronic acid, a reduction in pain and tendon thickness as well as a decrease in neovascularisation could be shown in both MPT and IT [12]. We recommend that the infiltrations be performed under ultrasound guidance in order to safely reach the peritendinous space. In addition, infiltrations can be performed almost painlessly. Sclerotherapy is a special form of treatment used to close sprouting neo-vessels. In cases of severe neovascularisation, it can quickly reduce pain. Infiltrations must be strictly extra-tendinous, ultrasound-guided and should only be performed by experienced therapists. Infiltrations in the tendon and bursa area with any type of corticosteroid should be avoided at all costs due to the potential for devastating tendon damage (Fig. 2).

USGET, EPI

In ultrasound-guided galvanic electro-physis therapy (USGET, EPI), acupuncture needles are placed under ultrasound guidance in the tendinopathy and microcurrents are applied via these (Fig. 3). This therapy stimulates the tenocytes to produce collagen. Depending on the pain experienced during treatment, the tendon can be infiltrated with a local anaesthetic under ultrasound guidance immediately beforehand in order to achieve sufficiently high currents. This has been shown to result in faster healing than with physiotherapy alone, although further studies with larger case numbers are certainly needed [13].

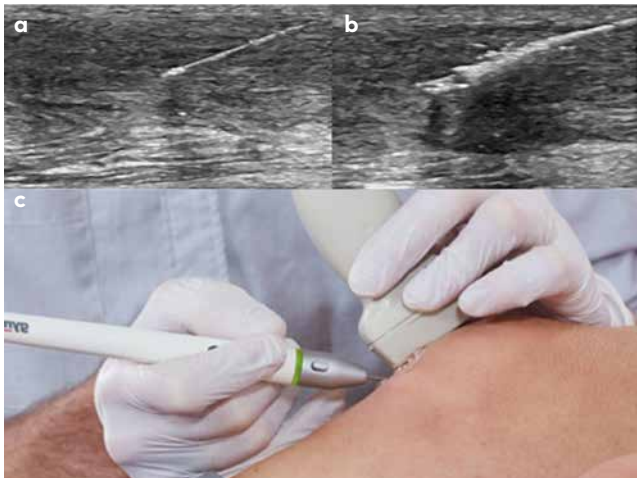

FIG. 3 Ultrasound-guided electrolysis therapy: **a** placement of the acupuncture needle; **b** visualisation of the acupuncture needle during electrolysis; c therapeutic setting

Surgical procedures

If conservative treatment fails, established surgical procedures are available for treating both MPT and IT. These include tenolysis of the tendon itself, with removal of the diseased tendon parts, and, in the case of IT, of the Haglund exostosis and possible intratendinous calcifications. In recent years, the influence of the plantar fascia tendon, which often runs medially to the Achilles tendon, has come into focus. In the case of MPT manifested in the medial buttress and sometimes visible annular ligament or existing adhesions, this must be addressed [14, 15].

CONCLUSION

The treatment of Achilles tendon tendinopathy is complex. Differentiated clinical and imaging diagnostics are required to make an accurate diagnosis. A distinction must be made between mid-portion and insertion tendinopathy, both in terms of pathogenesis and therapy. In recent years, dietary supplements such as curcuma, boswellia and others, as well as new therapeutic methods such as ultrasound-guided electrolysis therapy, have been established alongside classic methods. Surgical procedures are available in the event of failure of conservative therapy. Here, the focus has shifted to MPT caused by adhesions of the plantar fascia tendon.

The bibliography can be found with the article at www.sportaerztezeitung.com

PATELLA TIP SYNDROME

Case study: professional ice hockey player

THOMAS MAIER / TMPHYSIO MÜHLENINSEL, LANDSHUT

The patient (28 years old, professional ice hockey player, forward) presents with acute pain at the tip of the patella, which has been present for about five weeks. The symptoms occurred during intensive training weeks and the play-off phase. He reports pain (VAS 7/10) under load, e.g. during training, when sitting with bent legs and night pain. In the treatment history, he received several cortisone injections to reduce/control pain during the play-offs.

DIAGNOSIS

After a thorough functional diagnosis and imaging procedures, patellar tendinitis (jumper's knee) was diagnosed.

TREATMENT PLAN

Due to the previous cortisone injections, an alternative form of therapy was sought to alleviate the symptoms and support healing. However, the possibility of using shockwave therapy was ruled out because it is contraindicated within six weeks of a cortisone injection.

1. HIGH PEAK POWER LASER THERAPY

- Goal: Reduction of inflammation and pain relief.
- Application: The laser is positioned on the affected area. Daily sessions (5 x) of 19 minutes

Anti-inflammatory treatment protocol (EMS 905 nm high peak power laser):

1. Wavelength: the 905 nm wavelength is in the near infrared range and is the best compromise with the least absorption in the tissue.
2. Application: Laser therapy is used for pain relief (Mezawa et al.; Arch Oral Biol 1988;33:693–694), inflammation reduction (Bjordal et.al; Br J Sports Med 2006;40:76–80) and in combination with other therapeutic procedures (e.g. shockwave therapy).

2. NUTRITIONAL SUPPLEMENTS PHYTOPHARMACEUTICALS

- Aim: to improve tissue regeneration and reduce inflammation.
- How to use: 1 x daily, mix one shake with 10 g of powder (Insumed PHYTOSHAKE with curcumin, boswellia and bromelain) in 200 ml of water.

1. Anti-inflammatory effect: Curcumin has been shown to have anti-inflammatory properties that help reduce swelling and pain associated with sports injuries.
2. Pain relief: Due to its anti-inflammatory properties, curcumin can also help relieve pain. It can reduce the need for painkillers and provide a natural alternative for treating pain.
3. Support healing: Curcumin promotes the healing processes in the body by supporting the regeneration of tissue and cells. This can speed up the recovery process after injuries and make it easier to return to sport.
4. Antioxidant properties: Curcumin acts as an antioxidant and can help reduce oxidative damage to cells that can result from injuries and inflammation.

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OUTCOME

After one week of combined therapy, the player reported significant pain relief (VAS 1 / 10). A follow-up examination showed a significant reduction in the signs of inflammation in the affected area. In close consultation with the athletic trainer, he was able to return to full training and then full return to competition without pain. The intake of the nutritional supplement was continued (a total of 30 shakes).

CONCLUSION

The combination of High Peak Power Laser Therapy and PHYTOSHAKE proved to be an effective and conservative treatment method for patellar tip syndrome for the athlete. This treatment protocol enabled a faster recovery and return to competitive sports.

Personalized Injection Therapies

Regenerative Treatment Options Tailored to Patients' Needs

Arthrex SVF
The regenerative potential of the stromal vascular fraction

ACP Max™
Highest platelet concentration in leukocyte poor plasma

Arthrex ACP® Double Syringe
Simple and safe PRP preparation

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SINGLE INJECTION IMPROVES KNEE OSTEOARTHRITIS IN ATHLETES

A prospective study was conducted to examine the effect of a single 32 mg / 4 ml Hymovis MO.RE. injection in 31 athletes with knee osteoarthritis grades I – III. The participants were monitored with regard to knee function, pain, everyday activity and quality of life over a period of 360 days. The measurement methods used were KOOS, gait analysis, WOMAC and VAS pain score. Significant improvements in knee function and pain relief were observed. Furthermore, there were no serious side effects. The results of this study represent an advance in the treatment of knee osteoarthritis pain and the resumption of sporting activities. A single intra-articular injection of Hymovis MO.RE. (32 mg/4 ml) appears to provide a rapid, sustained and safe effect in regular athletes with knee osteoarthritis. Treatment with Hymovis MO.RE. could therefore represent a viable treatment option that meets the needs of the demanding subgroup of active patients with knee osteoarthritis resulting from overuse injuries. Comprehensive studies, including a control group, should be conducted in the future to confirm the efficacy of this single dose.

Bernetti A, Agostini F, Alviti F, Giordan N, Martella F, Santilli V, Paoloni M, Mangone M. New Viscoelastic Hydrogel Hymovis MO.RE. Single Intra-articular Injection for the Treatment of Knee Osteoarthritis in Sportsmen: Safety and Efficacy Study Results. Front Pharmacol. 2021 May 28;12:673988. doi: 10.3389/fphar.2021.673988. PMID: 34122099; PMCID: PMC8195240.

KNEE AND ANKLE CHONDROPATHY IN PROFESSIONAL FOOTBALL PLAYERS

This prospective clinical study examined the effect of two intra-articular Hymovis MO.RE. injections in 25 professional football players suffering from knee or ankle chondropathy. IKDC scores for knees improved from 46.8 ± 11.4 to 83.1 ± 12.5, and Lysholm scores from 58.8 ± 8.9 to 90.6 ± 8.3. For ankle patients, AOFAS scores improved from 52.2 ± 5.6 to 96.4 ± 4 . These improvements in functional assessment were maintained at 19 – 20 weeks, with no adverse effects or serious reactions reported. The study concludes that a single intra-articular injection of Hymovis MO.RE. (32 mg / 4 ml) repeated at 19 – 20 weeks may be a useful option to improve symptoms and function in professional footballers suffering from chondropathy in the knee and ankle. These observations suggest that single injections of Hymovis MO.RE. could be a useful option for treating patients with active osteoarthritis, as they increase patient compliance and enable them to maintain their usual level of physical activity, including training and competition. Further research should be conducted to confirm the efficacy of this treatment option.

Perticarini 2021: Hymovis MO.RE. in the treatment of knee and ankle chondropathy in elite athletes: preliminary results of the CHAMPS (Cohort study about HYADD4-G Administration for Pain relief on Soccer players) prospective clinical study

You want more informations? Talk with our scientific advisory board Alberto Schek, MD, at the isokinetic conference 2025 in Madrid at the Fidia Pharma exhibition stand.

CREATINE AND RESISTANCE TRAINING IMPROVE MUSCLE STRENGTH

A study submitted by AlzChem AG in support of a health claim pursuant to Article 13(5) of Regulation (EC) No 1924 / 2006 on creatine has been evaluated by the EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). 'Creatine is a non-essential nitrogenous organic acid that occurs in vertebrates, and it is also synthesised in the human body from L-arginine, glycine and L-methionine.' About 95 % of the creatine pool is located in skeletal muscle. The creatine content in foods can be measured by established methods. The study suggests that creatine in combination with regular resistance training (three times a week, for several weeks) can significantly improve muscle strength in adults over 55 years of age. Accordingly, a cause-and-effect relationship was found between taking creatine in combination with strength training and improving muscle strength. This applies to creatine taken at a dose of at least 3 g per day, but not to creatine taken only on training days. The study is based on 21 human intervention studies. The plausible mechanism of action of creatine to improve muscle strength was also taken into account.

Creatine in combination with resistance training and improvement in muscle strength: evaluation of a health claim pursuant to Article 13(5) of Regulation (EC) No 1924/2006. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) First published: 23 February 2016. https://doi.org/10.2903/j.efsa.2016.4400

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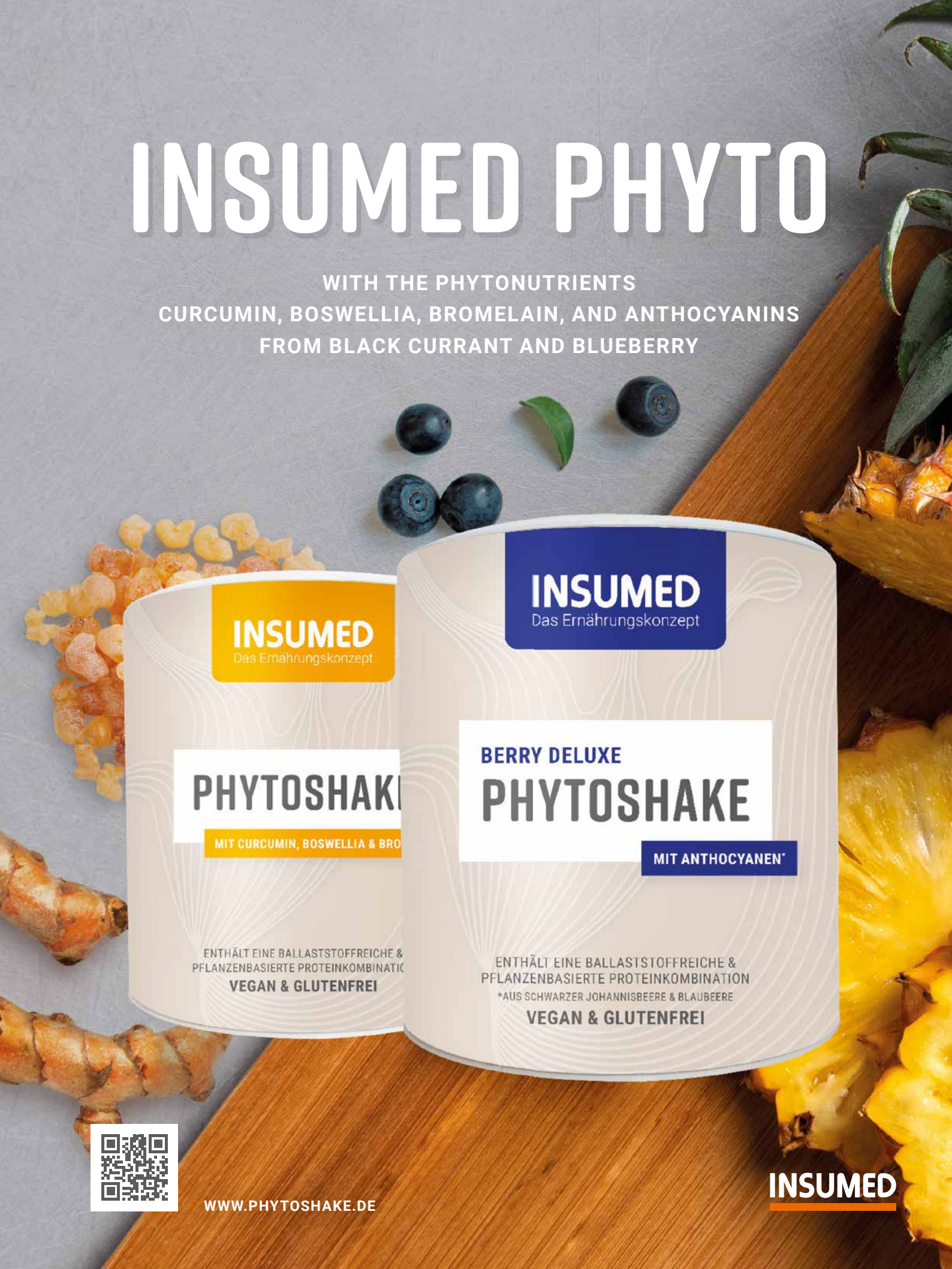

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