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The Sports, Ultrasound, Biologics, and Arthroscopy Protocol in the New Era of Orthopaedic Sports Injuries Treatments

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Abstract

In the new era of sports traumatology, the union of anatomical, biomechanical, and functional knowledge, together with an adequate clinical examination and complemented with ultrasound studies, arthroscopic surgery, and conventional surgery, makes us understand the pathology, in a new and modern way, of the locomotor system, such as the muscle, tendon, ligament, menisci, capsule, synovial membrane, as well as bone and cartilage pathologies. Biological therapies have shown a good result for soft tissue in chronic pathology that can be applied in an ultrasound-guided manner to treat tendinopathy of the Achilles, patellar, and quadriceps tendons, also at the elbow and shoulder level. It is striking to highlight the good results of this biological therapy with platelet-rich plasma for degenerative joint diseases in patients with moderate osteoarthritis. In cases in which conservative or biological therapies have not had their effect, we will generally indicate surgery, in most cases arthroscopically if it is joint pathology. This indication will be mandatory, especially in joint instability cases where we will require stabilizing surgery. We emphasize the importance of multidisciplinary teams where there must be a sports doctor, a sports traumatologist, a physiotherapist, a functional trainer, a podiatrist, biomechanics specialist, and other professionals that surround the athlete, such as the nutritionist, the psychologist so that the athlete has comprehensive assistance and is always well cared for. Together, these concepts make a personalized approach named the Sports, Ultrasound, Biologics, and Arthroscopy protocol to improve clinical results, shorten recovery times, and considerably reduce healthcare costs.

Keywords: Sports, Ultrasound, Biologics, and Arthroscopy protocol, Sports medicine, Ultrasound-guided therapies, Biological therapies, Arthroscopy

Introduction

The sharing of protocols and working in multidisciplinary teams have allowed expanding the knowledge between different medical specialties, featuring the possibility of performing new therapies that will pursue minimal approaches and even treating pathologies in a non-surgical way, obtaining satisfactory results, and significantly reducing the number of possible complications.

For this, we have been working for the last decade on four concepts that come into play, the Sports, Ultrasound, Biologics, and Arthroscopy (SUBA) protocol, which provides excellent results in current clinical practice when coordinated together.

The SUBA protocol systematically includes the application of the concepts of modern Sports trauma, the use of musculoskeletal Ultrasound in the office and the operating room, communing with the Point of Care Ultrasound philosophy. Third, consider Biological therapies as one more tool in the therapeutic arsenal where the cell will act as medicine, differentiating therapies between platelet-rich plasma (PRP) and cell-based approaches (Fig. 1).

And finally, the use of arthroscopic surgeries, minimally invasive procedures that will allow reproducing the classic "open" gestures in a way with minor tissue damage, thus allowing a better recovery.

That is why the SUBA protocol is improving clinical results, shortening recovery times, and considerably reducing healthcare costs.

Sports Medicine

We could almost speak of a new specialty since it combines the knowledge of modern traumatology with orthopedic surgery in minimally invasive regenerative techniques and arthroscopic surgery.

The sports medicine doctor must know the different sports, understand the various situations that athlete faces both in training and during the season, and assess their competition expectations. The athlete is an injured person with unique psychology who does not understand deadlines or slowing down. Although we must respect biological times, the modern sports medicine doctor must understand the athlete and his need to continue at the same level as soon as possible to provide treatments aimed exclusively at him. One of the keys is injury prevention, and educating athletes, teams, coaches, sports associations, and schools must be part of our daily medical care [1].

On the other hand, it is essential to find the diagnosis as soon as possible and in the most

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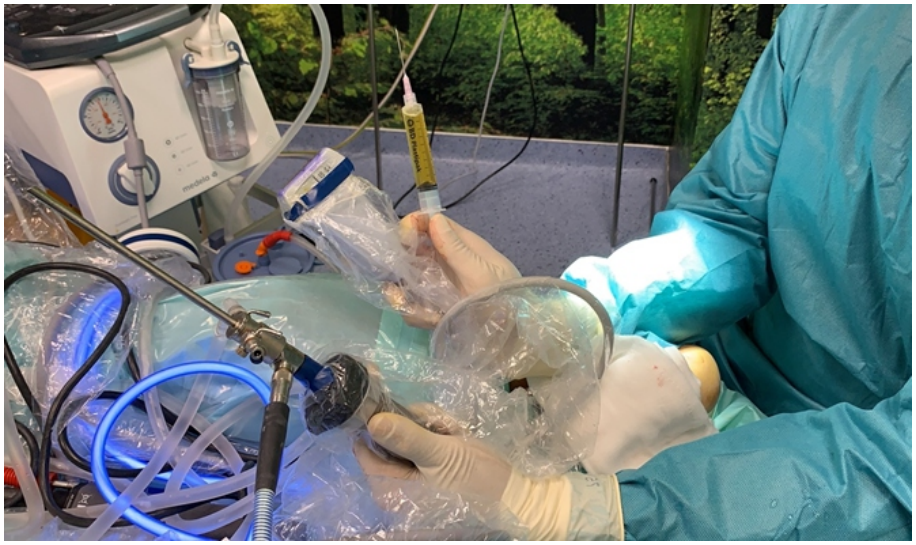

Figure 1: A picture showing a sports injury case treated with a biological arthroscopy and ultrasound-guided procedure in the Sports, Ultrasound, Biologics, and Arthroscopy protocol.

optimal way and treat injuries during sports with a recovery program and return to sport. The key to this new specialty is to combine the "biological healing" of the injury while we are "recovering" the tissues simultaneously.

That is why we moved from immobilizations and casts to functional bandages, neuro-taping, surgery with anatomical reconstruction, and internal fixation to perform early and functional physiotherapy.

It is evident that the success of sports traumatology has a multidisciplinary team, for this reason, it is necessary to have a team of sports physiotherapists and physical trainers who will complete the medical or surgical treatment, take care of muscular strength, improve joint balance, as well as functionality until it is fully integrated into the previous sports activity without limitations.

It is also essential to take care of nutrition and dietetics (weight control), gait analysis, and biomechanics.

That is why we defend that we do not treat sick people or patients but people, athletes who have some imbalance in their body, being healthy but that determines a decrease in their day today.

These might be

- Bad eating habits: go to a nutritionist or dietician
- Bad emotional habits: go to a sports psychologist
- Bad postural habits: go to a sports doctor, rehabilitator, or traumatologist.

We would participate in the latter. For joint pain due to "bad postural habits," it is necessary to inquire about what the injured person is doing wrong to avoid repeating it and promote healthy habits in their day-to-day life.

Among them stand out

- Weight loss in overweight patient
- Moderate daily or almost daily activity
- Avoid the repetitive practice of a single sport (e.g., running daily). It is interesting to intersperse aerobic sports such as running, swimming, cycling, and anaerobic sports
- The use of appropriate sports shoes and clothing
- A balanced diet.

With years of experience and good results, we now apply these principles to the entire population.

Our philosophy is very similar to Dr. Centeno's giving a broader approach than fixing a specific part of the musculoskeletal system (bones, joints, muscles, menisci, tendons, and ligaments), focusing on each part of the neuromuscular system as it is interconnected with the whole and as it is articulated through alignment and stability [2].

Following the SUBA Protocol, many orthopedic surgeons will likely indicate less surgery up front, opting for less invasive initial treatment, which we call interventional orthopedics. This is identical to what has happened in other areas of medicine, such as cardiology, which now has fewer more invasive open-heart surgeries and more X-ray-guided catheter procedures.

Interventional orthopedics represents the shift from joint salvage to repair. When the focus is on repair, the amount of knowledge the physician must have increased exponentially. Given its complexity, it is essential to analyze the entire musculoskeletal system by analyzing legs axis, dysmetria, joint stability, muscle tone, neurological, and vascular function. Dr. Schultz coined the term SANS: stability, articulation, neuromuscular, and symmetry (Fig. 2).

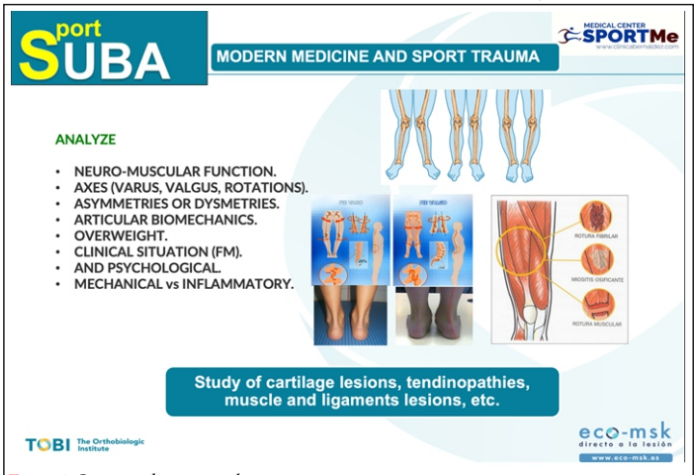

Figure 2: Sports medine approach.

Figure 3: Ultrasound-guided therapies.

Ultrasounds

With the incorporation of musculoskeletal ultrasound (MSK-U) in the orthopedic surgeon's office, a curious paradox has occurred: The patient perceives that the orthopedic surgeon explores him "doubly," first, he gets up from his chair and explores him, but also now when incorporating the MSK-U, he makes a gesture different from many other colleagues, unknown until then and is to perform an ultrasound scan in real-time. In addition to the considerable savings in health care costs that the same clinician carries out the ultrasound in the same visit, without needing to request more imaging tests on occasions, as well as optimizing the patient's time, the ultrasound not only allows us to diagnose lesions of the musculoskeletal system. Instead, it is a fantastic tool to assist us in performing numerous therapies on damaged tissues named ultrasound-guided therapies (UGT), including ultrasound-guided local infiltration, percutaneous needle tenotomy, intracapsular hydrodilation, hydrodissection, or high volume injection, percutaneous needle scraping (Scraping) and ultrasound-guided surgery [3,4,5,6].

Nowadays, clinicians can better evaluate soft tissue pathology such as tendinopathy, bursitis, fasciitis, effusions in the same consultation, in real-time, with high-resolution MSK-U images.

According to current data, UGT appear to be safe and effective, and this will increase as technology improves and the availability of ultrasound increases. They are generally more accurate than blinded injections. However, its evidence is still limited by its size and quality. Further research with prospective, randomized controlled trials with larger sample sizes and perhaps compared to other treatments further defines their safety, efficacy, cost-effectiveness, and role in treating musculoskeletal pathology (Fig. 3).

Biologics

The application of biological therapies can facilitate the healing mechanism of tissues with limited healing potential and vascularity such as tendons, cartilage, meniscus, and ligaments are changing the indications for treatment in orthopedics sports medicine [7]. However, due to the lack of a standardized harvesting and treatment algorithm, the efficacy of these new therapies is difficult to quantify. Different tissue sources have been used to obtain biological therapies, including blood, bone marrow, and fat.

PRP is a blood-derived product, where the blood is centrifuged to allow density separation of its components. There are multiple ways of preparing PRP: manual and commercial. Depending on the protocol used, the final preparation will vary [8].

PRP or cell therapies in daily practice is not just injecting "magic" cells but are part of a comprehensive treatment of joints, muscles, nerves, bones, tendons, and ligaments [2].

In musculoskeletal medicine, PRP is a promising treatment modality with clear evidence of safety. However, evidence of its efficacy has been mixed and highly dependent on composition and the specific indication [9]. Additional future high-quality, large clinical trials will be critical in shaping our perspective of PRP. The heterogeneity of PRP preparations, both presently and historically, has made interpreting the existing literature difficult and limits our ability to make definitive treatment recommendations.

Bone Marrow Aspirate Concentrate (BMAC) is obtained by the centrifugation of BMA. This process concentrates the mononucleated cells and increases the ratio of stem and progenitor cells. Frequently BMAC is referred to as a "stem cell" therapy; however, it is essential to mention that only 0.01–0.0001% of the heterogenous nucleated cells present in BMAC are stem or progenitor cells [10].

Few studies have demonstrated patient safety and improved clinical outcomes after BMAC treatment for OA; however, there is a lack of high-level studies or randomized trials with joint osteoarthritis.

Gobbi et al. [11], in a prospective study, concluded that the repair of full-thickness cartilage injury in the knee with a hyaluronic acid-based scaffold with BMAC (HA-BMAC) scaffold provides good clinical outcomes at long-term follow-up in the treatment of small to large lesions, single or multiple lesions, and lesions in 1 or 2 compartments, as well as in cases of associated lesion treatment [12].

Autologous micro fragmented adipose tissue (AMAT) is a term used to describe the minimally manipulated product of the mechanical breakdown of fatty tissue into tiny particles without requiring additives or ex vivo expansion. This process creates a product with a heterogeneous population of cells, including progenitor cells, monocytes, lymphocytes, macrophages, and claims to maintain the vascular niche and extracellular matrix [13].

A recent multicentric, international open-label study shows that a single dose of AMAT

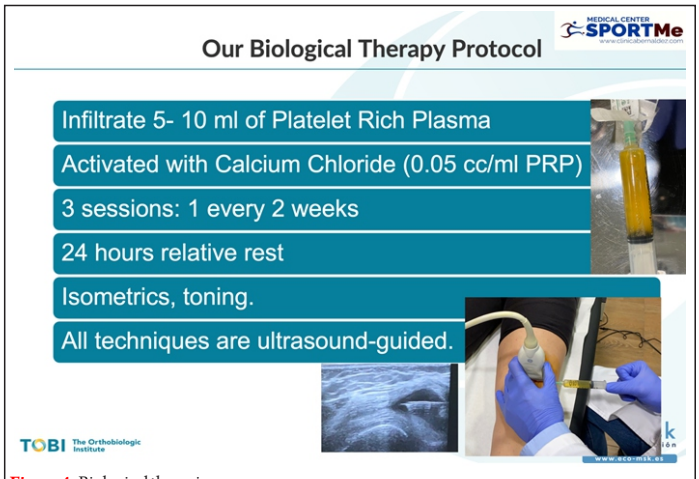

Figure 4: Biological therapies.

Figure 5: Arthroscopy techniques.

injection leads to clinical, functional, and quality of life improvement at 2 years in elderly patients, in KL grades 2–4 of knee osteoarthritis. These findings provide evidence that this treatment modality could be a safe and effective option to other commonly available treatments in carefully selected patients (Fig. 4) [14].

Arthroscopy

Arthroscopy is a type of endoscopy. The orthopedic surgeon always performs it.

It visualizes any joint (knee, shoulder, elbow, hip, wrist, ankle, etc.) to observe the different anatomical structures (cartilage, meniscus, ligaments, tendons, and synovial membrane). It has both diagnostic and therapeutic use.

Some surgeons perform almost 100% of their surgeries by this technique, and they are sports traumatologists (arthroscopic surgeons). Among the most frequent surgeries, the meniscus (or part) can be removed, sutured or transplanted, repair or reconstruct injured ligaments, repair or regenerate damaged cartilage. Suturing a tendon, ligament, or labrum, resecting bone (osteophytes and osteoarthritis), or removing a foreign body [15].

We can now use the arthroscope to perform endoscopy surgery consisting of the visualization of any space outside a joint like the bursae (resect them if they are inflamed), in the tendon sheaths (tenoscopies), and do extra-articular procedures. It is a less frequent technique, but we are doing it more and more because of the advantages and good results obtained [16].

Arthroscopy Common Indication by Joint

Shoulder

1. Rotator cuff tear's repair
2. Shoulder instability
3. SLAP lesions
4. Acromio-clavicular joint dislocation.

Elbow

1. Cartilage injuries
2. Articular fractures
3. Epicondylitis
4. Plica Syndrome

Wrist [17]

1. Articular fractures of the distal radius,
2. Triangular fibrocartilage complex injuries,
3. Intercarpal ligament injuries, and
4. Ganglion cysts.

Hip

1. Femoroacetabular impingement
2. Cartilage Injuries
3. Labral tears
4. Synovial disorders.

Knee [18]

1. Ligament tears
2. Meniscal injuries
3. Osteochondral defects.

Ankle

1. Cartilage defects
2. Anterior or posterior impingement.

Endoscopy Common Indications

Shoulder

1. Decompression of the subacromial space (Acromioplasty),
2. Bursectomy
3. Suprascapular nerve release (Neurolysis)
4. Extra-articular bicipital tenodesis.

Elbow

1. Release of the cubital tunnel or radial channel
2. Bursectomy.

Hip [16]

1. Trochanteric bursitis (bursectomy)
2. Pyramidal Syndrome
3. Snapping Hip

Ankle

1. Peroneal surgery
2. Bursectomy
3. Hagdlung disease.

The advantages of arthroscopy include mini-invasive, aesthetic and quick procedure, painless intervention, early discharge (3–8 h) from surgery, and fast recovery [19].

Today, there is no age or limits when it comes to undertaking a sporting action and the number of injuries, both traumatic and due to overuse, has multiplied exponentially (Fig. 5).

Conclusions

The union of biological, biomechanical, and functional knowledge, together with an adequate clinical examination and complemented with ultrasound studies or arthroscopic surgery, makes us understand the pathology of the soft tissues of the locomotor system in a new and modern way that we´ve called SUBA Protocol.

This structured and well-systematized approach ensures that the patient understands clearly the steps to be followed in the treatment of his locomotor system injury, starting from the most straightforward and least invasive to the option of surgery in case of not evolving thanks to SUBA Protocol favorably, we can confirm that the number of surgical indications has decreased considerably in our team and in that of many of our colleagues.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflicts of Interest: Nil. **Source of Support:** None.

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