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Michael A. Lee, MD, Editor

Adolescent Concussions— Management Recommendations (A Practical Approach)

Michael A. Lee, M.D.

There is an epidemic in our midst that most of us are unaware of. Untold numbers of young people are suffering concussions at an alarming rate. Many go unreported. The public as well as the medical profession have failed to appreciate the consequences of this problem and have been unaware of its significance and its long-term complications. In order to prevent both the short and potentially long term functional brain impairment that may occur if a concussion is not treated properly, the following management recommendations are outlined.

In the past few years, there has been a paradigm shift in the management of concussions. Prior to that, well over 20 different management guidelines were used and no one guideline or grading system was optimal. Patients were often told to “take it easy” for a few days and then to return to play. International concussion conferences in Vienna and Prague as well as recent research have caused a change in many of our concepts about concussions.^{1,2} Initially, amnesia was found to be more important than loss of consciousness in predicting poorer outcomes.³ Subsequently, **how long the concussion symptoms last has turned out to be far more important than the initial symptoms of concussions in predicting outcomes.** In laboratory tests of rats, it was

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Tendinopathy: Tendonitis or Tendinosis, Implications for Therapy

Stu Steinman, MD

This article discusses tendinosis and its treatment.

The term “tendonitis” to describe acute symptoms at the insertion of tendons as a result of overuse is a misnomer. The histopathology of these structures show disorganized collagen fibers, mucoid patches, and neovascularization. There is an **absence of inflammatory cells** on microscopic examination of these tendons. The use of the term “tendonitis” is misleading to both clinicians and patients as it implies that the use of strategies that reduce inflammation is the appropriate therapeutic intervention. In actuality **this condition is a degenerative process** thought to result from an ineffective, abnormal, or aborted inflammatory process. This pathophysiology has a fundamental impact on the approach to therapy. The effective long-term treatment of tendinopathys may rest on creating and directing an inflammatory process in the effected tendon in order to promote the deposition on new healthy collagen. The role of several new therapies

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Shoulder Instability in Athletics

Michael E. Joyce, M.D.

Traditionally, our understanding of shoulder instability in athletics is divided into two categories: traumatic instability (shoulder dislocations) and multidirectional instability. For those of us who regularly treat athletes, these two conditions are well understood. This discussion will review these classic conditions and then broaden the discussion to include the diagnosis and treatment of a more recently described area of athletic shoulder problems termed microanterior instability.

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Editor's Column

Spring has finally arrived, ushering in a new group of activities and sports. Just as professional baseball swings into action, youngsters all over the state are starting to play in their respective leagues. Over the last few years, the number of overuse injuries to pitchers has been escalating. In a recent article in *SPORTSMed*, Dr. Barry Goldberg discussed the latest recommendations for the maximum number of pitches youngsters should throw. In an effort to decrease the number of shoulder and elbow injuries that occur, I have reprinted the recommendations from Dr. Barry Goldberg's article in *SportsMed* [see page 8].

In this issue, Dr. Joyce discusses shoulder instability and a new special sling that may decrease the incidence of recurrent shoulder dislocation. Dr. Steinman points out in his article that there is no inflammation in tendon injuries. This condition should be called tendinosis and not tendonitis.

Since more high schools in Connecticut are starting to do baseline ImPACT testing of athletes participating in contact sports I have summarized the latest recommendations for treating concussions. Schools, and especially teachers, should be aware of the modifications that concussed individuals require. Students are not malingering. They need time to recover and shouldn't be forced to take tests or turn in papers, especially during the early period of recovery.

The Connecticut Children's Hospital has recently approved a formal concussion program as part of its sports medicine program. It includes neuro-cognitive testing and a neurologist and a neuropsychologist are on the staff.

Please suggest future subjects for discussion and review in *SPORTSMed*.



Michael A. Lee, M.D.

Connecticut SportsMed

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Adolescent Concussions: Management Recommendations (A Practical Approach)

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found to take approximately two weeks to recover from a concussion. We can draw the conclusion that humans may act similarly. Research subsequently showed that with the mildest of concussions, the bell ringer (ding) concussion, it took approximately one week to recover.⁴ With the realization of Second Impact Syndrome (a person under age 21, whose initial concussion symptoms are unresolved, may suffer sudden death if there is a second concussion within two weeks of the first concussion), it is clear that adolescents must to be protected from this potential catastrophic event.⁵

We have learned many new facts about concussions. Concussion manifestations vary from individual to individual. Lesser blows can cause more symptoms. The corollary is also true, that harder blows may cause fewer symptoms. Younger athletes (in high school or lower grades) have been shown to exhibit longer recovery times when compared to college and professional athletes.⁶ There may be a significant risk if they return to play too quickly. Concussions seem to have more symptoms and last longer in females.⁷ A gene may exist that causes some individuals to be more susceptible to concussions.⁸ What we now know is that **each concussion should be treated individually** depending on the symptoms and the neuro-cognitive test results. This may be the reason why standardized management guidelines were unsuccessful. The following recommendations are made to improve concussion management and speed the recovery process.

RECOMMENDATION #1

NO ADOLESCENT WITH A CONCUSSION SHOULD CONTINUE TO PLAY OR RETURN TO A GAME AFTER SUSTAINING A CONCUSSION.

Athletes continuing to play

(exercise) or receiving multiple blows to the head, after suffering a concussion, may take longer to recover from a concussion. They also may be more at risk for developing post-concussion syndrome.

IMMEDIATE EVALUATION AND EXAM AFTER A CONCUSSION

- o While it is important to do a neurological exam to rule out a bleed, it is normal in the vast majority of patients. Occasional balance problems or nystagmus on lateral gaze may be found and they usually disappear as the patient recovers.
- o CT scans and MRIs of the head are usually normal and are not necessary unless the patient has increasing symptoms or there is concern that there might be a bleed. (Research indicates that functional MRIs and PET scans can show the area of the brain affected.)

RECOMMENDATION #2

AN INDIVIDUAL SUSTAINING A CONCUSSION SHOULD CEASE DOING ANY ACTIVITY THAT CAUSES THE SYMPTOMS OF A CONCUSSION TO INCREASE (e.g. headaches, dizziness, nausea, etc.)

Due to the metabolic imbalance that occurs following a concussion, it has been shown that increased blood flow to the brain during recovery may impede or slow down the recovery process and worsen the symptoms of concussion. Most patients do not need to be placed on bed rest unless they are having severe symptoms (severe headaches, marked photophobia, disorientation, balance problems, extreme fatigue, etc). They may participate in any activity that doesn't cause increased symptoms (headaches). In some cases, activities such as reading, watching TV, working at the computer and having heated discussions with others may increase symptoms. **If patients develop increased symptoms while do-**

ing a specific activity, that activity should be discontinued.

Many concussed individuals may be unable to concentrate (focus). They may not be able to read or absorb material and may develop an increased headache while doing so. When this occurs, they might be able to participate in an activity for only a few minutes before symptoms increase. If a rest break can be interspersed between those few minute intervals, these activities can be done. As the symptoms abate, longer intervals can be spent reading, watching TV and using the computer.

Continuing to do activities, or exercise that increases symptoms, can delay the recovery from the concussion.

Tylenol can be used to help headache symptoms.

RECOMMENDATION #3

SCHOOL ATTENDANCE AND ACTIVITIES MAY NEED TO BE MODIFIED.

School:

While some individuals may be able to attend school without increasing their symptoms, the majority will probably need some modifications depending on the nature of the symptoms. Trial and error may be needed to discover what they can and cannot do.

- o If students are unable to attend school for an entire day without symptoms, they may attend for a half day. Some students may only be able to attend for one period, some not at all, due to severe headaches or other symptoms. Frequent breaks with rest periods in the nurse's office may be necessary. Often, alternating a class with a rest period may be helpful. Math causes more symptoms in my patients than other subject classes. As recovery proceeds, gradually hours spent in school

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- may be increased.
- o Depending on their symptoms, some students may need to be driven to school to avoid walking and should be given elevator passes to avoid stairs. They should not attend gym or exercise classes initially.
- o Workload and homework may need to be reduced. Frequent breaks while doing homework may be helpful. Term papers should be postponed. Pre-printed class notes and tutors may help to relieve the pressure of schoolwork.
- o Tests: If there are concentration and memory problems, quizzes, tests, PSAT tests, SAT tests and final exams should be delayed or postponed. If test results are poor, a note to the school should request that the scores be voided. Extra time (un-timed tests) may be necessary initially when test taking is resumed.

Activities:

- o If noise causes increased symptoms, students with concussions should not listen to loud music (especially in cars or I-Pods). They should avoid attending dances, parties, music concerts and sports events until the hyperacusis is gone.
- o If light causes increased symptoms or students have photophobia they should avoid bright sunlight and exposure to flashing lights (computer games). Sunglasses may be necessary.
- o My experience suggests that spinning carnival rides should be avoided while recovering from a concussion.

RECOMMENDATION #4

NEURO-COGNITIVE TESTING IS AN IMPORTANT COMPONENT FOR THE MANAGEMENT OF CONCUSSIONS.

The use of neuro-cognitive testing is one piece of the puzzle

in assessing recovery from concussions and determining the timing of return to play. *It should only be used as a tool, and should not be the only deciding factor in returning a concussed athlete to play.* It provides objective data and prevents athletes who hide their symptoms from returning to play before they are fully recovered. While there are several available tests to accomplish this, the one with the widest acceptance and the largest data base is the ImPACT Test developed at the University of Pittsburgh. The ImPACT Test is used by the NFL, NHL and other professional sports organizations. It is used by many universities and is now recommended by some states for high school students. This test is recommended by the CIAC in Connecticut to be used as a baseline in Connecticut high schools.

Although this test can be used without a baseline (due to the enormous data base of normal controls that have been developed) it is more easily and effectively used with a baseline test. Special training is necessary to use it without a baseline. There are two parts of the test, the Symptom Score component and the six part neuro-cognitive test component. **Both component scores should return to baseline or normal before an athlete is allowed to resume playing a contact sport.**⁹

Generally, the symptoms of a concussion disappear before the neuro-cognitive findings return to normal, although occasionally, this can be reversed. I have seen a patient with zero symptoms following a concussion whose ImPACT test took two weeks to return to normal. *It is for these reasons that symptom evaluation alone can not be used as the sole criteria for return to play.*

Migraine headache concussion symptoms, as opposed to the usual generalized headache of a con-

cussion, are predictive of poorer scores on ImPACT testing and are associated with a longer healing time.¹⁰ Increased headaches often occur when taking the initial ImPACT test after a concussion. The different components that are measured (verbal and visual memory, processing speed and reaction time) usually correlate with different regions of brain function that may be involved with the concussion.

- o Individuals who score well below expected levels of function initially (e.g. 1st percentile across all four summary scores) should be monitored very carefully as they will usually take longer to heal and may be more prone to developing post-concussion syndrome. They may need greater school or activity modification, perhaps not attending school for a prolonged period. Initial bed rest may be necessary.
- o Individuals with high reaction times (e.g. scores > .70 on ImPACT) should not drive and, initially might need greater activity modifications, sometimes even bed rest.
- o Increasingly poorer successive ImPACT test scores will identify those individuals who continue to exercise or do activities that cause their symptoms to increase.

RECOMMENDATION #5

NO ATHLETES SHOULD RETURN TO CONTACT COMPETITIVE SPORTS UNTIL THEY ARE SYMPTOM FREE, BOTH AT REST AND WITH EXERCISE AND HAVE NORMAL NEURO-COGNITIVE TESTING.

Usually concussed athletes will start to recover rapidly once the feelings of foggy and being slowed down disappear. Students may literally wake up one morning and say, "Wow, I'm back to

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normal!" **When they have no headaches or other concussion symptoms athletes can begin the concussion graduated return-to-play exercise program** that was recommended at the Prague Concussion Conference.

Day 1: Walking for 20-30 minutes at a rate of 2-1/2 miles per hour

Day 2: Jogging for 20-30 minutes

Day 3: Running for 20-30 minutes

Day 4: Performing sports specific practice drills

Day 5: Return to contact sport if **RECOMMENDATION #5 is met**

If headaches or other symptoms occur, during any step, the activity needs to be stopped. The athlete should then wait 24 hours and start at the previous level again.

Post-Concussion Syndrome

Fortunately, post-concussion syndrome occurs only occasionally, but it is devastating to those individuals encountering it. It is usually defined as having **concussion symptoms that last for greater than a month** after the initial blow. The problems that can develop are categorized as follows:

- o **SLEEP ISSUES** – Initially, most concussed individuals are very fatigued and sleep more than usual. As the concussion persists, they may have difficulty falling asleep and sleep less than usual. Lack of sleep causes major difficulties and should be resolved before treating the next two issues. Sleep disorders can be treated with medication such as Elavil.¹¹
- o **CONCENTRATION AND MEMORY ISSUES** – Inability to concentrate (focus) and poor memory, often associated with increased headaches during schoolwork, may cause poor school attendance and performance. It can take months, or

even longer, to recover from this. Methylphenidate or Strattera may be helpful.

Full neuro-cognitive testing and rehabilitation may be indicated in some cases.

- o **DEPRESSION AND OTHER PSYCHIATRIC PROBLEMS** –Although depression may be caused by the concussion itself, the persistence of symptoms and being unable to play may also cause depression. Psychotherapy and anti-depressant medication therapy may be warranted.

Individuals with concussions often suffer frustration and anger due to the curtailment of their normal activities. They may not be able to participate in their chosen sport or attend school. **Support groups may help individuals cope with their feelings.**

Some athletes may not be able to return to contact sports due to the long term symptoms they have suffered as a result of their concussion.

Conclusion

In summary, each concussion should be treated individually. No one guideline will work for each patient. The general public, physicians, coaches, trainers, parents, and the athletes themselves, must be educated about the signs, symptoms and treatment of concussions. Generally, the athlete may be unaware that they have sustained a concussion. In order to prevent poor outcomes from concussions, it is crucial to educate athletes. Therefore, the last recommendation is:

RECOMMENDATION # 6

ALL SPORTS AND HEALTH EDUCATION PROGRAMS SHOULD TEACH STUDENTS THE SPECIFIC SIGNS AND SYMPTOMS OF CONCUSSIONS. INSTRUCTORS MUST EMPHASIZE THE SERIOUS

CONSEQUENCES OF IGNORING CONCUSSION SYMPTOMS AND THE CONSEQUENCES THAT WILL OCCUR IF CONCUSSIONS ARE NOT PROPERLY TREATED.

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Shoulder Instability in Athletics

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Acute Anterior Shoulder Dislocation:

Acute anterior dislocation of the shoulder is a common problem that occurs when athletes are involved in a fall or collision that forces the arm into an externally rotated and abducted position. The athlete experiences immediate pain and will most often protect their arm in an internally rotated and abducted position.

Examination shows an asymmetry in the contour of the deltoid, increased pain with manipulation of the arm, a loss of ROM, and in up to 30% of patients, an axillary neuropraxia. The diagnosis is confirmed with proper radiographs to rule out a fracture of the proximal humerus or glenoid. It is not unreasonable to attempt a shoulder reduction on the athletic field without radiographs if it is done with gentle traction using a counter traction technique. Traction is applied in a longitudinal fashion until a clunk is felt, at which time the athlete will have instant symptomatic relief. Immediate reductions are much easier than delayed reductions since they precede the severe muscle spasms that will quickly lock the shoulder in the dislocated position. When attempting a reduction without radiographs one should be gentle and only try once; if that doesn't work the patient should be immobilized and transported. Often prone reduction on a bench or table is easily accomplished. Bent elbow traction is safely applied.

First time dislocators develop recurrent instability 50% to 100% of the time. Treatment with immobilization has long been thought to have no impact on the incidence of recurrent dislocation, however **recent studies that utilize a special sling that holds the arm in an adducted and externally rotated position are changing our thinking.** Since this sling reduces the labral/capsular lesion (Bankart lesion), dramatic reductions in

recurrence may be possible.

Today we evaluate first time dislocators with a contrast enhanced MRI. For patients with a significant Bankart or Hill-Sachs lesion early arthroscopic stabilization surgery is offered. Results with this surgery in the acute setting have been good, with less than a 10% rate of recurrent instability. Results of arthroscopic stabilization in patients with chronic-recurrent instability show a higher incidence of failure, therefore these patients are treated with a traditional open Bankart repair and capsular shift. Most surgeons still believe the results of an open repair are better than arthroscopic stabilization in collision athletes such as football. I will treat some athletes that sustain a first time dislocation during their competitive season with a course of successful physical therapy and a brace that limits abduction and external rotation. These athletes undergo surgical treatment at the conclusion of their season.

Multidirectional Instability:

Multidirectional instability is the result of excessive capsuloligamentous laxity that is most often congenital and involves other joints. Examination shows increased anterior and posterior laxity as well as a sulcus sign. It is not unusual to have a patient with a traumatic dislocation that is superimposed upon underlying multidirectional instability. Rehabilitation is the mainstay of treatment in these patients. Strengthening of the rotator cuff muscles combined with activity modification can dramatically reduce symptoms of instability and apprehension in these patients.

For patients with multidirectional instability (who are not voluntary dislocators) that fail conservative treatment, surgery can be considered. An open inferior capsular shift can be success-

ful in up to 80% to 90% of patients. Recurrent instability, additional surgical procedures, and restricted activities afflict many of these surgical patients. We learned in the late 1990s that thermal capsular shrinkage, which had good short term results, lead to many long term failures and has therefore been widely abandoned.

More recently we have seen encouraging results with arthroscopic placcation of the joint capsule. In this procedure, multiple sutures are used to place "tucks" in the joint capsule followed by a closure of the rotator interval. For surgeons that have perfected this technique, the incidence of recurrent instability is as good as or better than an open capsular shift.

Microanterior Instability:

The concept of microanterior instability is a departure from the traditional classification of instability as traumatic or multidirectional. Athlete's subject their shoulder to extreme positions, high speeds and excessive loads. When these forces combine with joint laxity the repetitive microtrauma results in several degenerative shoulder conditions. These patients will present for evaluation not with a complaint of instability, but instead complaining of shoulder pain.

Evaluation with MRI or diagnostic arthroscopy yields an array of pathologies. The most common condition has been termed "internal impingement." For overhead throwing athletes the shoulder is in an abducted and highly externally rotated position that allows for the undersurface of the supraspinatus and infraspinatus to impinge upon the superior-posterior labrum. With repetitive throwing the patient develops an undersurface rotator cuff tear and/or superior-posterior labral tear.

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Shoulder Instability in Athletics

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Initial treatment for internal impingement is rotator cuff rehab combined with a correction in throwing mechanics. As pain subsides, the athlete is returned to sports with an interval throwing program that allows for a gradual reintroduction of then repetitive forces. This is initially successful in over 90% of athletes, although for those that continue in their sport, especially at the professional level, recurrence is high.

Currently, the surgical treatment is controversial and highly individualize to each athlete's need. Arthroscopic debridement of the partial undersurface rotator cuff tear and labral tear is successful at relieving pain and allowing a return to sports, however the

recurrence rate is up to 20% in two years. None-the-less, for athletes that only have a few years left in their career, this could be all the treatment they need. For patients with internal impingement and a long career ahead of them, an arthroscopic debridement combined with a capsular placcation will lead to better long term success. While athletes treated with arthroscopic debridement alone can return to successful throwing in 8 to 12 weeks, athletes treated with an arthroscopic placcation (with or without repair of the rotator cuff and labrum) often need 12 to 18 months to recover.

Conclusion:

Our understanding and treatment options of shoulder instabil-

ity have evolved over the past 10 years. Advances in rehabilitation have allowed successful recoveries in athletes who can now avoid surgery. Many athletic careers have been extended with advances in arthroscopic shoulder surgery. None-the-less, it is the early diagnosis and treatment that is critical to the preservation of the athletes' shoulder.

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Tendinopathy: Tendonitis or Tendinosis, Implications for Therapy

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will be presented in this context.

Tendinosis is frequently associated with an inflammatory process in the paratenon (paratenonitis). This may explain why anti-inflammatory therapies may cause a transient improvement in symptoms, while at the same time impairing long-term prognosis of patients with tendinopathies. Paratenonitis is best exemplified by DeQuerviens "Tendonitis," where swelling, and crepitus over the tendon sheath are prominent physical findings.

The metabolic inactivity of tendons mandate that the recovery period for tendinosis is at least 12 weeks and usually takes six months. It takes 12 weeks for collagen to fully mature, align and form cross-links with adjacent fibers. This must be kept in mind otherwise the patient and the practitioner may prematurely abandon effective therapy. Therapy begins with pain relief. Protection, Relative Rest, Ice, Compression, Medications (anti-inflammatory for

paratenonitis, analgesics for pain), protection from further injury (bracing, orthotics) and modalities should be employed for the first one to two weeks to control symptoms.

Symptom relief is not the same as cure. Once the patients' symptoms are under control, attention can be directed to improving the quality of the tissue. Fibroblasts must be recruited to the sight of injury so that collagen can be deposited and matured, thus restoring normal tendon structure.

Extra Caporal Shock Wave Treatment (ECSWT), Pro-Inflammatory (Prolo) therapy, and High Voltage Electrical Stimulation are thought to be of benefit by inciting local inflammation, leading to the recruitment of fibroblasts, deposition of high quality collagen and the improvement in vascularity.

Eccentric strengthening exercises promote healing by increasing tenocyte metabolism, thus increasing the rate of collagen production. The axial loading of

tendons help to orient collagen fibrils parallel to the tensile forces and promote normal architecture.

Surgery restores normal tissue architecture by excising the degenerative tissue. In addition this surgical intervention stimulates the inflammatory process. Surgery involves a lengthy rehabilitation process, which employs several of the techniques mentioned above.

The literature regarding many of the above therapies is sparse and contradictory. Basic science research coupled with randomized, controlled, blinded clinical trials is necessary before appropriate therapy can be prescribed with confidence.

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Editor's Column

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Pitching Recommendations

Based upon the expertise and studies performed and sponsored by USA Baseball, the following recommendations have been made to reduce the incidence of overuse pitching injuries and optimize the performance of youth baseball players.

1. Coaches and parents should react appropriately to complaints about arm pain. Medical attention should be sought if pain is not relieved within four days or immediately recurs when pitching is resumed.
2. Pitch counts should be monitored and regulated. These should be approximately:

Age	Pitches Per Game	Pitches Per Week	Pitches Per Season	Pitches Per Year
9–10 year olds	50	75	1,000	2,000
11–12 year olds	75	100	1,000	3,000
13–14 year olds	75	125	1,000	3,000
15–18 year olds*	100	150	1,500	4,000

*No data—reasonable estimate.

Pitch limits do not include throws from other positions, instructional pitching during practice sessions and throwing drills, which are important for the development of technique and strength. Backyard pitching practice after a pitched game is strongly discouraged.

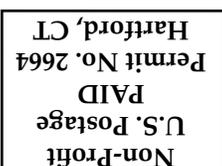
Pitchers should develop proper mechanics and include more physical conditioning as their body develops.

A pitcher should not repeatedly return to the mound in a game once removed as the pitcher.

Pitchers should not pitch for more than one team at the same time.

Baseball players should not compete in baseball for more than nine months in any given year as time is needed to give the pitchers body an opportunity to rest and recover. Stressful overhead activities (competitive swimming, football quarterback, softball, etc.) should be avoided during this time.

Pitchers are discouraged from participating in showcases unless permitted time to appropriately prepare.



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