

# REHABILITATION MODES FOR PATIENTS WITH ILIOTIBIAL BAND FRICTION SYNDROME

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## Summary

**Introduction and aim.** Iliotibial band syndrome is often found in people involved in different sports. According to medical literature, it is most commonly found in runners. The aim of this paper is to cover a mode of rehabilitation for patients with iliotibial band syndrome.

**Material and methods.** The most common cause is the conflict between iliotibial tract and lateral epicondyle of femur. The syndrome found in athletes is a result of an improper training program.

**Results.** The mode of rehabilitation should be applied on the basis of patient's functional state and the progression of the disease. The basis of treatment consists of kinesiotherapy with loosening and stretching exercises for shortened muscles and enhancement exercises for weakened muscle groups. Additional physical procedures include cryotherapy, phonophoresis, iontophoresis and ultrasounds. Other treatment methods include deep tissue massage and kinesiotaping.

**Conclusions.** During the rehabilitation patients should be educated about the prevention of iliotibial tract overloads.

**Key words:** kinesiotherapy, iliotibial band friction syndrome

## Introduction

Knee pain is one of the most common health problems in runners. Yearly injury occurrence in high-intensity runners (>32km per week) is as high as 34-65%. Injuries in runners can have two sources. The first one is joined to improper skeletal structure, faulty body posture and improper motion habits. The second one is connected with training errors. The most common mistakes made by runners include miscalculated duration time, improper frequency and intensity of training and switching too fast between different training stages [1,2].

Iliotibial band syndrome (ITBFS) is one of the most common injuries in runners. It accounts for 1.6%-12% of all overload syndromes in runners. It occurs in amateurs, as well as in medium and long-distance professional runners. It very rarely occurs in sprinters [3,4]. This syndrome also is common among cyclists (15-24% of all overloads), dancers, soccer players, weight-lifters, tennis players and soldiers (1-5.3% of all overloads). Iliotibial band syndrome is rarely found in people with low physical activity [5, 6, 7, 8]. The first case of ITBFS was described by Renne in 1975 [9].

Until recently the cause of ITBFS seemed to be obvious, as it was supposed to arise from conflict between iliotibial tract (ITB) and lateral epicondyle of femur. It was thought that during the change in the knee's position from full extension to flexion, the band moves from the frontal arrangement in relation to lateral epicondyle of femur, to the rear position in relation to this epicondyle. This position change occurs in the flexion of the knee of around 30 ° [10]. With every movement the band moves back and forth in relation to the epicondyle,

which creates the friction. This can give rise to the synovial fold and bursa inflammation [1,11]. Research shows that ITBFS is not caused by the “jumping” of the band over the epicondyle, but by the pressing. The study with MRI has shown the between lateral epicondyle of femur and ITB there is no synovial bursa. There was however a pressure-sensitive, highly vascularized and richly innervated connective tissue in the form of fat pad. High vascularization of the connective tissue explains the edema occurring in this particular area. The presence of Pacinian corpuscles makes it possible for the fat pad to receive proprioceptive signals and absorb the forces. The role of the synovial bursa is played by the recess of the lateral knee joint capsule, which during the movement of the knee slips between the lateral epicondyle and the band. When the knee is bent at 30°, with internal rotation of tibia bone, the band presses against the epicondyle. During the extension, the band comes back to its place in the lateral direction. It is believed that the band does not move significantly along the epicondyle, but that it is attached to the epicondyle by fibrous branches, which make it impossible for the band to move in the sagittal plane. The feeling of band’s motion in this plane is probably an illusion caused by the changes in the tension in different parts of the band. Additionally, during the progression of the knee’s flexion, biceps femoris acts as a bowstring and it pulls the band towards itself, which also creates the feeling of band’s back and forth motion [11,12].

## Physiotherapy

The most important goal of physiotherapy in ITBFS is to eliminate the causal factors [13]. Before choosing the right form of physiotherapy, the state of injury progression needs to be established. Linderberg lied down a grading system for ITBFS:

- Grade 1 - pain starts after the run, but it does not affect performance.
- Grade 2 - pain occurs during the run, but does not affect performance.
- Grade 3 – pain occurs during the run and it affects the performance.
- Grade 4 - pain prevents running.

### I. Acute phase

The main goal of the treatment in this phase is to reduce the inflammation. The methods used in this phase include: massage with ice cubes, iontophoresis and phonophoresis [14]. In the acute phase, it is advised to use continuous-wave ultrasounds in following parameters:  $0,5W/cm^2 \times 3 \text{ MHz} \times 5 \text{ minutes}$  (in further treatment this can be increased to  $1W/cm^2$ ). [5]. Oral application of nonsteroidal anti-inflammatory drugs can reduce the pain and the inflammation. Running and cycling should be avoided in this phase in order to prevent the conflict between the band and the epicondyle of femur. The only physical activity allowed is swimming with lifebuoy between the legs [14]. In order to preserve previously achieved performance, it is better to reduce the training rather than abandon it altogether. If it is possible then the aerobic exercises should be continued through cross training, based on small loads or load-free, such as running in water [2]. If the tumescence is smaller after 3 days of treatment, local injections can be considered [14].

### II. Subacute phase

Stretching exercises are introduced when the acute phase turns into subacute phase. In order to extend contracted muscles „stretch-relax” exercises are used, in which submaximal contraction should last for 7 seconds and the extension should last for 15 seconds [15]. The optimal number of repetitions and their duration time are still debated. Latest research involving animal models showed that the tissue extends up to 80% during the fourth repetition of relaxation, and that it achieves the maximum point of extension between 12 and 18 second

[16]. Rehabilitation pays particular attention to the extension of the iliotibial band. Iliopsoas muscle, rectus femoris muscle and surae muscle should also be extended if their contracture was established during an examination. The treatment can be supplemented with the elimination of myofascial restrictions, the method of Proprioceptive Neuromuscular Facilitation (PNF) and biofeedback [9,13,15].

Myofascial restrictions which can cause additional problems in ITBS include:

- Trigger points in the gluteus minimus and the vastus lateralis muscles
- Trigger points between the vastus lateralis and the biceps femoris muscle
- Contracture of the vastus lateralis
- Fascial adhesions in the posterior segment of the iliotibial band
- Trigger points in the tensor fasciae latae muscle, radiating to the anterior and lateral parts of the thigh, up to the knee joint.

Petit [13], in his ITBFS case-report, used medial patellar mobilizations and muscle contractions in the lateral musculature (with the use of point motor electrostimulation).

### Deep massage

Athletes have an iliotibial band which is shortened, contracted and sensitive. Initial strategy should include extension, followed by massage focused on separating the iliotibial band from the hamstring muscles and the quadriceps femoris muscle, which can pull the band in the anterior or posterior direction [18].

1. The stretching of the iliotibial band (Figure 1). Movements are performed slowly, in the oblique plane, from the tensor fasciae latae muscle down, through the knee joint, to the proximal part of the shin. Active extension and flexion of the knee will increase the effectiveness of the massage. First movements of the massage are done with forearm, after initial relaxation of the band, one can start the massage with fist and then with phalanxes.
2. Alternative position for the relaxation of the iliotibial band. The patient slides down, so his extremity hangs down the table and is pulled down by gravity. The extremity on which the patient is laying is flexed in order to ensure stability. This technique is not to be used in patients with lower spine disorders (Figure 2).
3. The rolling and raising of the iliotibial band. The band is to be gripped and slowly rolled “back and forth” and simultaneously visualizing raising of the band from the femur bone (Figure 3).
4. The separation of the iliotibial band from the surrounding muscle groups (Figure 4).
5. The stretching of the band in the proximal direction: one hand (lower) pulls the band downwards, the other hand (upper) with its entire palm surface pulls the band up (Figure 5).
6. The lateral stretching of the iliotibial band: joined fingers 2, 3 and 4 of both hands stretch the band from the middle to the outer parts, starting from the distal attachment (Figure 6).
7. Working with the tendon: therapist puts his one thumb on the other, then he applies his thumbs on the distal attachment of the band, presses and moves upwards. If it is possible, the patient actively extends the knee joint.

According to Magier [19], massaging the whole band with one stroke should be avoided, as it can cause the feeling of itching in the entire lower extremity. Shorter strokes are preferable, directed at the posterior side of the band, going from the middle of the band to hip joint, and next from the middle down to the knee joint.



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during or after training. Muscle stretching before training helps to prevent microinjuries in soft tissues. Stretching during training can serve as an additional warm-up or a pause after a few kilometers of running. Stretching after training is the most important because during training the muscles are forced to continuous contraction which has to be countered. This way, we can prevent the perpetuation of the contraction and its negative results. The process of stretching should be smooth rather than rapid. During the pulsating stretch, muscle receptors are activated, which, in order to prevent injury, activate the muscle to contract (by enabling the motorneuron of a given muscle in the spine). This type of stretching can cause a defense reaction in the form of increased tension, causing microinjuries in muscle fibers responsible for the reduction of myofascial elasticity [20].

Examples of stretching exercises for ITB:

1. Stretching in the standing position (Figure 7): “unoccupied” extremity is flexed in the knee joint, “occupied” extended extremity is crossed behind the “unoccupied” extremity. The exercises involve stretching of the band by extending the arm on the side of extended lower extremity and bowing the entire body in opposite direction. Alternative position involves lowering of the torso in the direction of foot in the “occupied” extremity (Figure 8) [15].
2. “Pretzel” (Figure 9): lying down on the side on a healthy extremity, both extremities flexed in the knee joint. Both knees touch the couch. Patient holds with a hand the forefoot of the “occupied” extremity, extending in the hip. The foot of the healthy extremity pushes into the knee of the stretched extremity in the direction of the couch [5].
3. Self-stretching with the use of a roll (Figure 10): the body is supported on the side, the roll is under the “occupied” lower extremity. Upper extremity on the side of healthy lower extremity is on the hip. Patient moves along the side of the thigh on the roll [14].
4. Self-stretching in a supine position with the use of tape (Figure 11): lying on the back with body shaped in arch. Patient extends the “occupied” lower extremity and puts it under the other, knee and hip-flexed extremity. The tape, towel or belt is put on the stretched extremity. Patient abducts the lower extremity until the feeling of stretching in the lateral part of thigh or above the coxal bone occurs. Post-isometric relaxation techniques can be included. Post-isometric relaxation in this particular case can be achieved by the exerting contraction in the direction of separation without any movement [19].

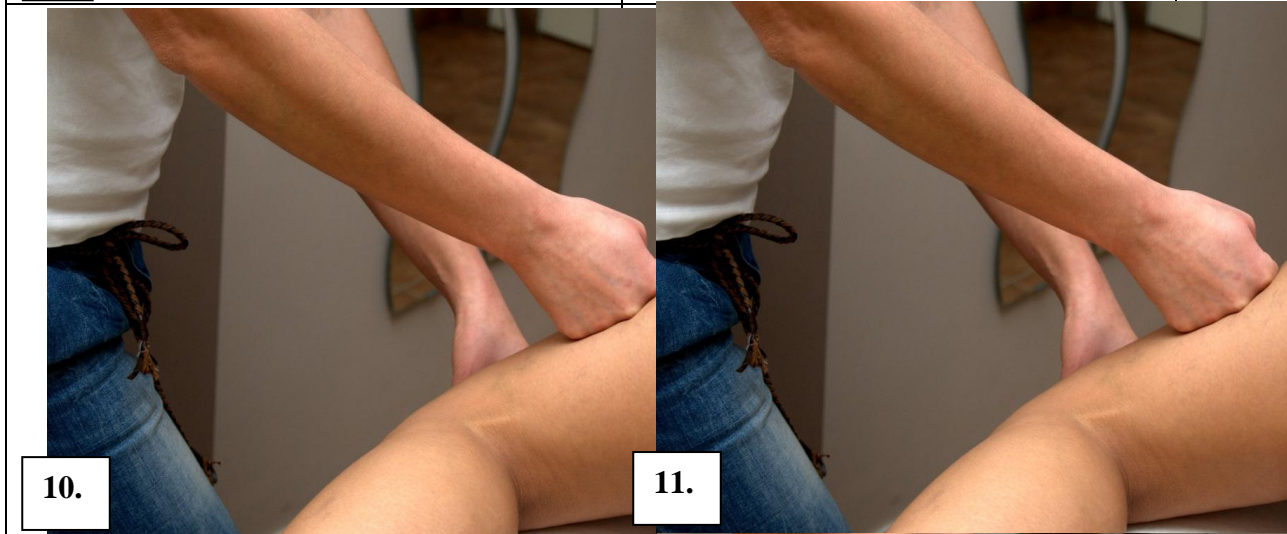


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## Strengthening phase

Strengthening exercises is introduced when the normal range of motion is achieved and the myofascial restrictions are eliminated [15].

Examples of strengthening exercises:

1. “Clamshell” (Figure 12): lateral recumbent position. Lower extremities are flexed in the knee joints. The “occupied” extremity is on the top. Patient abduces the hip joint in 30° with the isometric tension of the gluteus medius muscle. The exercise can be performed with the back put against a wall. In the fourth week of rehabilitation a one-meter thera-band can be used in order to increase the intensity of the exercise [5, 9].
2. Resisted squats (Figure 13): sitting on a chair with feet widely spread. Thera-band tied around the knees. Patient has to move from the sitting position to standing position with stretched to the front and the band stretched around the knees. In order to increase the intensity of the exercise, a disc can be put under the “occupied” extremity [9].
3. Front, rear and side lunges with pelvis kept in a single position. This exercise can be performed in the fourth week of rehabilitation [5, 14].
4. “Dead lift” (Figure 14): standing on one, flexed, “occupied”, lower extremity, patient holds a weight in the opposite hand, initially places in the area of “occupied” lower extremity. Patient goes from the bent position to the standing position through the extension of the “occupied” extremity and the abduction of the upper extremity holding the weight [9].
5. One leg squat with the use of a thera-band and a wedge (Figure 15): standing on one “occupied” leg, the “unoccupied” being flexed in the knee joint. The band is attached at one end to an object standing in front of the patient, and at the other end to the popliteal fossa of the weight-bearing extremity. The heel and the rearfoot of the weight-bearing extremity is on the wedge. Patient squats slowly and then goes back up even more slowly, until the extremities are extended. During the flexion, the knee joint should not go beyond the toes’ line [13].
6. “Hamstring Curl” (Figure 16): patient is in the supine position, hands lying along the torso, big ball is placed under the “occupied” extremity in the ankle joint area, the other lower extremity is elevated. Patient pushes the hips upwards while simultaneously standing with the foot of the “occupied” extremity [13].



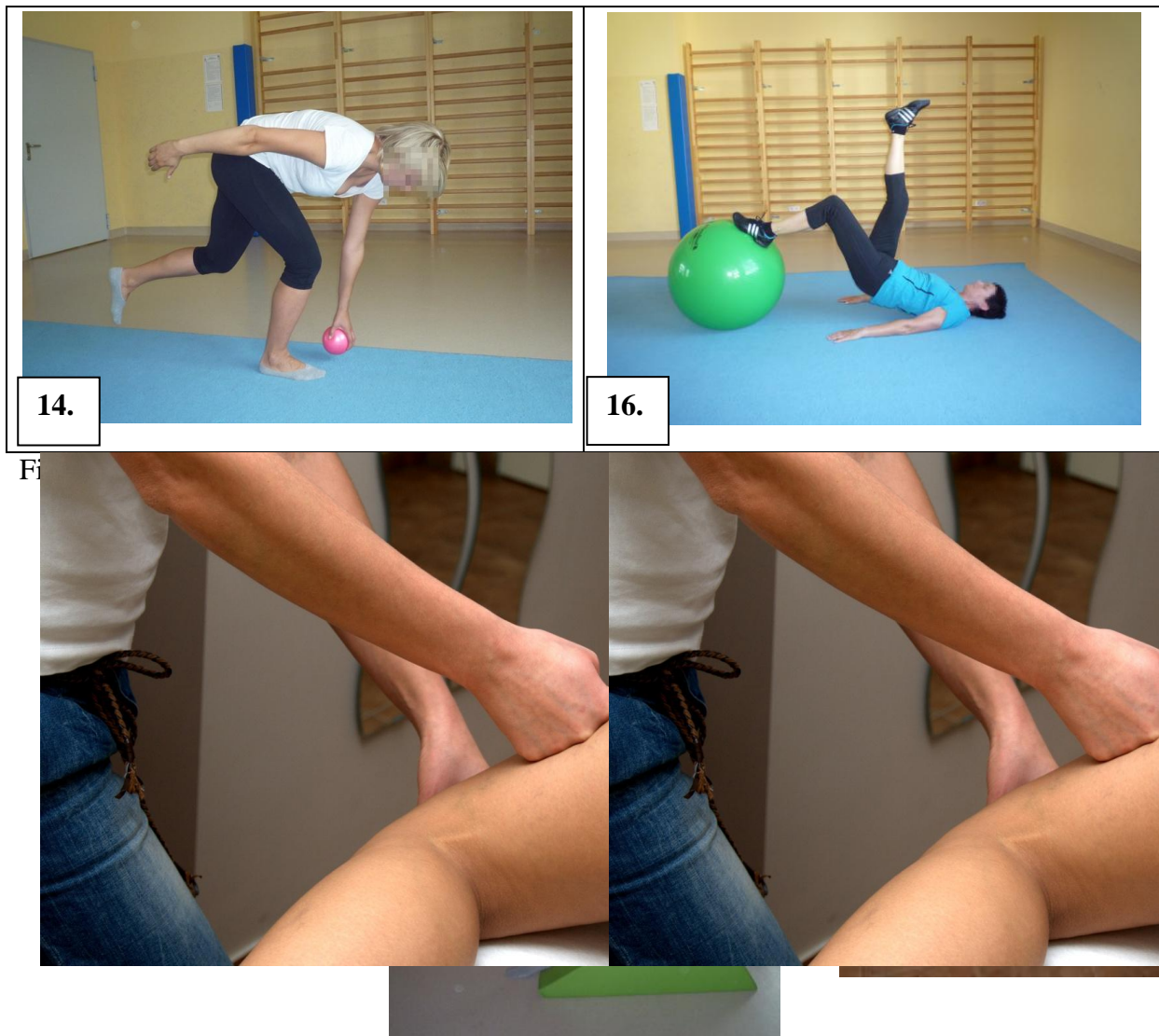


Figure 15. One leg squat with the use of a thera-band and a wedge.

### Kinesiotaping in the treatment of iliotibial band syndrome (ITBS)

Kinesiotaping is an effective complementation of the treatment, supporting the reduction of the inflammation and decreasing the tension in the iliotibial band. There are three major forms of application [20]:

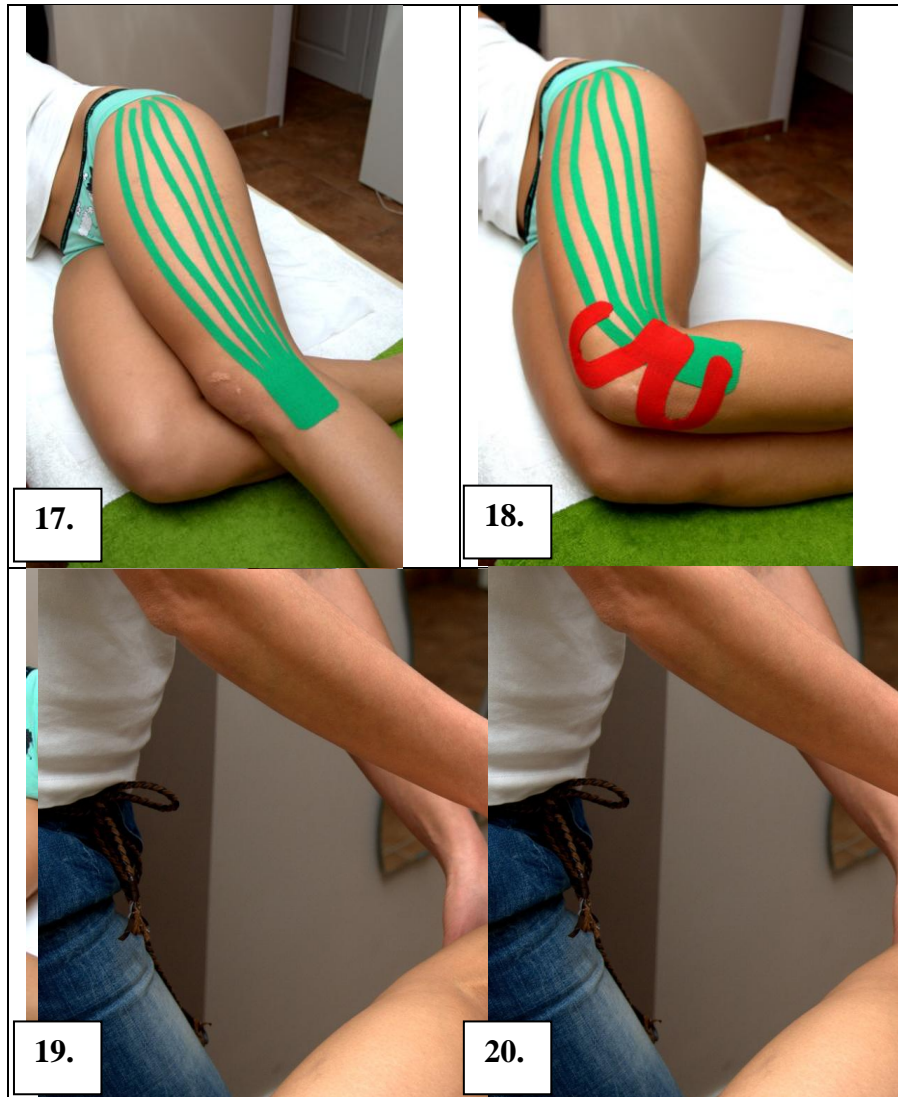
Application #1: “The insertion to origin” technique. This application helps to reduce the inflammation process and reduces the swelling. Patient lies on the back, the iliotibial band is in a stretched position. The length of tape needed for application is measured. The base is placed in the distal attachment of the band. The rest of the tape is cut into, more or less, 6 pieces. The internal and the external tape is placed along the edge of the tensor fasciae latae muscle, and the mesial tape is attached on the band. During application, the tape needs to be stretched in about 25% (Figure 17).

Application #2: “Mechanical technique”. This application is used to limit the mobility of the band in relation to the lateral epicondyle of femur. The tape needs to be cut into a “Y”-like shape. The base is placed in an inferolateral direction from the epicondyle. Painful area should be placed between the cut elements. Next, while holding the base of the tape with one hand, knee joint should be flexed and the cut pieces of the tape should be applied with the stretch of 50-75%. The upper tape is put above the aching area and stuck “turning” it outside,



so it becomes U-shaped. The ending of the upper tape is stuck without any stretching. The lower tape is stuck in an analogous way, starting below the aching area. The final result resembles the letter “M” (Figure 18).

Application #3: One tape is applied along the length of the tensor fasciae latae and the iliotibial band. The application can take the form of technique #1 or #2, depending on whether the therapist wants to reduce the inflammation or immobilize the band. The base is applied with no stretching in technique #1. Next, patient is put in the position of the extended band and then the tape is stuck in the proximal direction (Figure 19). The final application can be found in figure 20.



Figures 17-20

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no pain being  
sprint is advised

3 or 4 weeks, the distances can be increased, as well as the frequency of running. It is thought that increasing the distance for 0.8km and increasing the training time for 3-5 minutes every day is a rational option [9, 14, 21].

Most injuries in training come from the training regimen, and that is why it needs to be analyzed carefully. Training regime should include days of intensive exercises (qualitative) and days of less intensive exercises. Intensive day means gradual increase in the effort, but less intensive days should not jeopardize the achievements gained during qualitative exercises. Most runners can take three days of qualitative training for 7-10 days of less intensive training. Weekly number of kilometers should not be increased more than 5-10%. Mild “undertraining” and consistency in training are better than the risk of injury in case of overtraining [2].

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