

# Physiotherapy in diastasis of the rectus abdominis muscle for woman during pregnancy and postpartum – a review paper

## Postępowanie fizjoterapeutyczne u kobiet w ciąży i w połogu z rozstępem mięśnia prostego brzucha

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### Keywords

pregnancy, puerperium, physical therapy, rectus abdominis, muscle dehiscence

### Abstract

**Introduction:** *Diastasis recti abdominis* (DRA) is defined as the increase between two abdominal rectal muscles located on both sides of the linea alba at the height of the navel. It occurs in pregnant and postpartum women due to the loosening of the linea alba during pregnancy under the influence of hormones and the developing foetus. The most common risk factors for dehiscence are: large foetus, large volume of foetal waters, multiple pregnancy, excessive abdominal muscle overload during the third trimester, obesity and too intense pressure during delivery.

**Study aim:** The aim of the study was to present diagnostics and surgical as well as non-operative treatment for women with abdominal muscle diastasis due to pregnancy and during the puerperium period. Diagnosis of dehiscence primarily includes palpation, calliper measurements, ultrasound and CT scan.

**Materials and methods:** Scientific bases such as Pubmed, Scencedirect, Google Scholar and Ebsco were searched.

**Results:** A total of 48 scientific reports from Pubmed, Scencedirect and Google Scholar were collected.

**Conclusions:** Diastasis of the rectus abdominis muscle can be treated preventively by introducing appropriate prophylaxis, which aims to strengthen the transverse and the rectus abdominis muscles, as well as learning the right posture and principles of proper performance of activities such as lifting heavy objects. In the event of diastasis occurring in the puerperium period, its size can be reduced in a non-invasive manner or even completely eliminated after introducing appropriate exercises, being supported with orthopaedic equipment if necessary. Exercises should be individually selected by a therapist and performed under his/her supervision at the initial stage of training to teach the patient to properly activate the transverse abdominal muscle. Pregnant women who do not have contraindications to physical activity can reduce the risk of the DRA by performing appropriate exercises.

### Słowa kluczowe

ciąża, połóg, fizjoterapia, mięsień prosty brzucha, rozejście mięśni

### Streszczenie

**Wstęp:** Rozstęp mięśni prostych brzucha definiowany jest jako zwiększenie odległości na wysokości pępka pomiędzy dwoma mięśniami prostymi brzucha położonymi po obu stronach kresy białej. Dochodzi do niego u kobiet w ciąży i po porodzie z powodu rozluźnienia kresy białej w przebiegu ciąży pod wpływem hormonów i rozwijającego się płodu. Najczęstsze czynniki ryzyka wystąpienia rozstępu to: duży płód, duża objętość wód płodowych, ciąża mnoga, nadmierna praca mięśni brzucha w trzecim tryestrze ciąży, otyłość oraz zbyt intensywne parcie podczas porodu.

**Cel pracy:** Celem pracy było przedstawienie diagnostyki oraz leczenia operacyjnego i nieoperacyjnego kobiet z rozstępem mięśni prostych brzucha z powodu ciąży i w okresie połogu. Diagnostyka rozstępu obejmuje przede wszystkim badanie palpacyjne, suwmiarką, USG i TK.

**Material i metoda:** Prześledzono bazy naukowe takie jak Pubmed, Scencedirect i Google Scholar, Ebsco.

**Wyniki:** Łącznie zgromadzono 48 doniesień naukowych z baz Pubmed, Scencedirect i Google Scholar.

The individual division of this paper was as follows: a – research work project; B – data collection; C – statistical analysis; D – data interpretation; E – manuscript compilation; F – publication search

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**Wnioski:** Rozejście mięśnia prostego brzucha może być leczone zapobiegawczo przez wprowadzenie odpowiedniej profilaktyki, która ma na celu wzmocnienie mięśnia poprzecznego i mięśnia prostego brzucha oraz naukę odpowiedniej postawy i zasad prawidłowego wykonywania czynności takich jak np. podnoszenie ciężkich przedmiotów. W przypadku wystąpienia rozejścia w położeniu, można w sposób nieinwazyjny zmniejszyć jego rozmiar lub nawet całkowicie zlikwidować po wprowadzeniu odpowiednich ćwiczeń, wspomagając się w razie konieczności zaopatrzeniem ortopedycznym. Ćwiczenia powinny być indywidualnie dobierane przez terapeutę oraz wykonywane pod jego kontrolą w początkowym etapie treningu aby nauczyć pacjenta prawidłowej aktywacji mięśnia poprzecznego brzucha. Kobiety w ciąży, które nie mają przeciwwskazań do aktywności fizycznej, wykonując odpowiednie ćwiczenia mogą zmniejszyć ryzyko wystąpienia RMPB.

## INTRODUCTION

*Diastasis recti abdominis* (DRA) is defined as the increase between two abdominal rectal muscles located on both sides of the linea alba at the height of the navel<sup>1</sup>. The fibrous band which is the linea alba sags during pregnancy and as a result, the left and right parts of the rectus abdominal muscle separate from each other<sup>2-4</sup>. Diastasis does not give any signs of pain but significantly affects the condition and function of the muscles, which after delivery, do not always return to their original state. Properly tensed abdominal muscles provide support to the internal organs and stabilise the lumbar spine. This is also associated with maintaining proper posture and protection against excessive pelvic tilt and aggravation of lumbar lordosis. Therefore, abnormal abdominal muscle function can lead to overloaded back pain due to increased compression of the intervertebral joints and to more severe complications such as abdominal hernia<sup>2,5</sup>. Abdominal muscle function in pregnancy deteriorates and elevating the head and shoulder-blades in supine position becomes impossible<sup>6</sup>.

The size of the diastasis considered as pathological is defined differently. Some state it to be diastasis above 2.7 cm at the level of the umbilicus<sup>1</sup>. Other authors define abdominal diastasis of the rectus abdominis muscle as inter-recti distance (IRD) above 2 cm at one or more points at the height of the navel or 4.5 cm above or below the navel<sup>7-9</sup>. In studies conducted by Mota et al., the correct width of DRA in pregnancy was determined as 49 to 79 mm under the navel, 54 to 86 mm 2 cm above the navel and 44 mm to 79 mm 5 cm above the navel when the foetus is within the 20<sup>th</sup> and 80<sup>th</sup> centile. During the puerperium peri-

od, at week 6, IRD should be 9 to 21 mm, 17 to 28 mm and 12 to 24 mm, respectively<sup>10</sup>.

There is little awareness of this problem in society. The results of the research by Rajkowska and Szumilewicz showed that the majority of the surveyed women did not know what DRA is and whether they have this problem. They also did not have any information regarding possible exercises involving the abdominal muscles that could be performed during pregnancy<sup>11</sup>. Pregnancy without complications can be a motivation for women who had a sedentary lifestyle before pregnancy to add appropriate aerobic and strengthening exercises to their activities, and those who were physically active before pregnancy, should continue this lifestyle<sup>12</sup>. Exercises increase tolerance to physical effort, improving body posture. Properly selected, they prevent or reduce pain in the lumbar spine area. This can be of benefit during delivery and subsequent newborn care<sup>13</sup>.

Every other woman may have DRA following pregnancy, but proper therapy can reduce IRD. It is important to make women aware of the nature of DRA, its predisposing factors, consequences and physiotherapeutic treatment<sup>14</sup>.

## STUDY AIM

The aim of the study was to present diagnostics and treatment of women with diastasis recti abdominis due to pregnancy and during the puerperium based on a review of the literature.

## MATERIAL AND METHODS

The aim of the work was carried out based on the analysis of 48 scientific reports from 1988 to 2019, and

coming from the following databases: Pubmed, Scencedirect and Google Scholar.

## RESULTS

### Classification of diastasis recti abdominis in pregnant and postpartum women

Nahas created an objective classification for abdominoplasty according to myofascial deformities (2001). He properly defined types A, B, C and D:

- A. Pregnant women or puerperas who develop DRA as a result of pregnancy and there are indications for suturing both parts of the rectus abdominis;
- B. Pregnant women or puerperas in whom the distal and deeper part of the abdominal wall is loosened, which is revealed after closing of the anterior parts of the rectus abdominal muscle;
- C. Pregnant women or puerperas whose rectus abdominal muscle is laterally attached to the rib synchondrosis. In this case, the insertion on the posterior sheath is released and attached to the anterior sheath of the rectus abdominis muscle;
- D. Pregnant women or puerperas with a slightly slimmer waistline, rotation of the external abdominal oblique muscle combined with suturing the anterior sheath of the rectus abdominal muscle is the chosen procedure in this case.

Although this classification does not focus on the diastasis of the rectus abdominis muscle, it is often used in the medical environment<sup>1,15</sup>.

Clinically, there are two subgroups of women with DRA after pregnancy. The first is women who, thanks to multidisciplinary treatment, are able to regain proper load transfer

through the abdominal wall, with or without DRA narrowing. The second group consists of women who have the potential to regain optimal functioning of the deep muscles and their ligaments of the sacroiliac joints or pubic symphysis, have not changed, DRA is larger than normal, but they are not able to effectively transfer loads through the abdominal wall. In this group, the middle fascial structures are damaged and it is not possible to sufficiently tense the abdominal muscles when performing functional tasks in an upright position (standing on one leg, squatting, walking, changing position from sitting to standing, climbing stairs). In this case, abdominoplasty may be considered in women after delivery because there is significant long-term damage to the central fascia structures, which means that sufficient tension for proper functioning cannot be obtained<sup>16</sup>.

#### Diagnosis of rectus abdominis diastasis in pregnant and puerperium women

DRA diagnostics include palpation, measurement using a calliper and ultrasound. Palpation can exclude the presence of DRA, but it is difficult to determine the exact width of the diastasis structures. The test is carried out in supine position, with the lower limbs bent in the hip and knee joints, the feet placed on the ground. The subject raises her head gently, the examiner puts his/her hands on the pa-

tient's abdomen so that the wrists rest on the abdomen and the fingers compress the abdomen in the midline at the level of the navel, perpendicularly and transversely to the linea alba (Figures 1, 2 a and b). At this time, the patient bends her trunk, lifting her head from the ground and gently raising her shoulder-blades. She may stretch her hands towards the knees. The presence of DRA is confirmed by a palpable cavity under the fingers towards the abdominal viscera, and a loose linea alba can be palpated. Both parts of the rectus abdominis should be tensed on the sides. The test is positive when 3 or more fingers are in the space between the edges of the tense parts of the rectus abdominis. The width of one finger

is considered as 1 cm, so a diastasis of 3 fingers is considered to be more than 2 cm wide. The same palpation is performed 4.5 cm above and below the navel. In this area, the separation is assumed to be 1 cm wide (according to Giljeard and Brown, 1996), because in these locations, the linea alba is narrower<sup>17,18</sup>. The manual or digital calliper measurement is an accurate, frequently used and simple method<sup>2</sup>. Ultrasound is the most reliable and accurate method for assessing DRA. This test is widely used, but great skill and experience are required to accurately assess the occurrence and size of DRA. In works describing various methods of DRA diagnostics, it has been demonstrated that there are several ways to car-



Figure 1

Head lift, shoulder blades lifted off the ground and palpation of the linea alba by the therapist - side view



Figure 2 a and b

Palpation along the linea alba (a). Palpation across the linea alba, checking for two-finger wide diastasis (b) – bird's-eye view.

ry out this test depending on the examiner performing the measurement<sup>2,19,20</sup>. However, they do not diverge too greatly. The general assumption is: the test is performed in supine with the lower limbs bent in the knee joints, the upper limbs are placed along the body. The distance is usually measured 2 cm above and below the navel. The image is usually taken at the end of exhalation. Images are also taken during abdominal muscle tension (shoulder-blades elevated above ground level)<sup>19</sup>. Mola et al., comparing palpation with ultrasound, found that the palpation was reliable enough to be used in clinical testing<sup>21</sup>.

Computed tomography is also used to measure and evaluate DRA. This is a highly detailed method that provides radiological assessment of DRA width. During the test, the most centrally located rectus abdominis muscle fibres are identified which does not significantly affect muscle activity and function. This causes a problem in measuring the width of the DRA - the distance may be smaller than in reality. Computed tomography is a method that exposes the patient to ionizing radiation<sup>1</sup>.

#### **Risk factors of rectus abdominis diastasis in pregnant and puerperium women**

Risk factors affecting DRA are age, body height, pre-pregnancy body mass, body mass during pregnancy, large foetus, large volume of foetal water, multiple pregnancy, excessive abdominal muscle overload in the third trimester, obesity and excessive pressure of a closed glottis during the second delivery period and subsequent pregnancies<sup>9,22</sup>. Other risk factors of weakening the abdominal muscles before pregnancy also cannot be excluded. Baissaounnault and Blaschak have shown that DRA was not present in women who systematically performed abdominal strengthening exercises before pregnancy<sup>8</sup>. Strengthening of the abdominal muscles during the pre-pregnancy period also reduces the likelihood of DRA, and if it occurs, the size of the diastasis is smaller<sup>19,23</sup>.

Lo et al. also indicated caesarean delivery as risk factors<sup>8</sup>. It has been concluded from research conducted by Rett et al. and Demartini et al. that DRA is more common in multipara than in the case of primipara<sup>24,25</sup>. It has also been assumed that performing regular exercises strengthening the abdominal muscles before pregnancy and continuing them during the course of pregnancy can influence a more effective delivery (shorter delivery phase) and reduce the risk of Caesarean section<sup>18,26,27</sup>. The latest research, however, indicates that there is no relationship between regular exercise to strengthen the abdominal muscles and the type of delivery<sup>28</sup>.

#### **Consequences of rectus abdominis diastasis in pregnant and puerperium women**

As previously mentioned, properly tensed muscles ensure proper posture without excessive pelvic tilt, protecting the internal organs and providing stability of the lumbar spine area, but they also help with breathing and trunk movements. The increased distance between two parts of the muscle places the above tasks in a state of danger, which can weaken the muscles and affect their functions. As a result, the trunk mechanics, pelvic stability and body posture change as well as their function are weakened<sup>21,29</sup>. The changes increase with the progression of pregnancy. Anti-resistance pelvic stabilisation is reduced up to at least 8 weeks following childbirth<sup>18</sup>. In cases where the RDA is significant, there may be problems with the delivery as well as with trunk mobility (flexion, rotation and lateral flexion of the trunk)<sup>5</sup>.

Pain in the lumbar spine area, which also often appears in the case of RDA, is not directly related to this pathology, but it occurs because of incorrect posture and biomechanical changes caused by muscle weakness. Overload or compensation of other muscles due to the lack of integrity of the abdominal muscles, unstable trunk, shallow breathing, uterine prolapse or its pathological enlarge-

ment may also contribute to back pain. DRA can also cause weakened pelvic floor muscles, problems in returning to regular exercise or with activities that require lifting and pelvic organ prolapse<sup>2,5,30</sup>. Many women also experience weakened libido. This is due to a decrease in the sense of female sexuality, which is very much associated with a negative image about the appearance of one's own body<sup>2,5</sup>. More recent studies, however, show that the relationship of DRA and lumbar pain, lumbar and pelvic girdle pain, or of the pelvic girdle itself, is not significant. Furthermore, no significant association of DRA with urinary incontinence has been found<sup>29</sup>. Two studies conducted in order to evaluate the relationship with organ prolapse showed conflicting results<sup>31,32</sup>. In contrast, satisfaction with quality of life regarding the area of health was reduced in women with DRA<sup>29</sup>.

#### **Treatment of rectus abdominis diastasis in pregnant and puerperium women**

Surgical treatment is carried out to reduce some of the effects of DRA, in particular, pain in the lumbar spine area<sup>23</sup>. There are several methods of surgical DRA correction: conventional surgery, abdominoplasty, laparoscopic method, endoscopic muscle plication<sup>33,34</sup>. Non-surgical procedures include abdominal muscle exercises, education about correct posture and ergonomics, external support in the form of stabilisation using an elastic bandage and a corset, as well as aerobic exercises<sup>1</sup>. The most common exercises appearing in literature are related to tension of all abdominal muscles and the transverse abdominal muscle. Both exercises were performed in the same initial position: supine position, knee joints bent at an angle of 90°, feet resting on the ground, upper limbs extended along the body. During abdominal tension, the patients were instructed to raise their head and shoulders so that they did not touch the ground while the fingertips touched the knees (Figure 4). Correct perfor-

mance of the exercise with the activation of the transverse abdominal muscle first consisted of inhaling, then during exhalation, bringing the abdominal muscles closer to the spine<sup>5,35</sup>. This exercise can contribute to IRD reduction. This can be seen from the very beginning during isometric muscle tension. A decrease in IRD occurs in puerperium women and in those who have never been pregnant<sup>36</sup>.

### Physical therapy of rectus abdominis diastasis in pregnant and puerperium women

The training programme, which achieved good results in the study by Litos, can serve as an example of a DRA treatment programme. It consisted of isometric and isotonic exercises for trunk stabilisation. The whole programme consists of 18 meetings with a therapist; in addition, the patient exercises alone at home. The following are examples of exercises that were gradually introduced into training programme during subsequent sessions and were individually tailored to the needs of the patient (Table 1)<sup>37</sup>.

In studies, it has been shown that women starting a therapeutic programme aimed at reducing IRD can achieve the same results as wom-

en who have already started exercising during pregnancy. Sharma recommended exercise for patients involving transverse abdominal muscle tension, resistance training and aerobic exercises with a qualified trainer<sup>38</sup>. Transverse abdominal muscle tension should be gradually progressive; from prone position, to lying sideways to supported kneeling<sup>39</sup>.

Women who have been diagnosed with DRA during or after pregnancy should: avoid lifting heavy objects, get out of bed by turning sideways with bent knees and hip joints positioned so as not to engage the abdominal prelum. Flexion of the knee and hip joints is also useful when performing daily activities. Some authors also warn against performing abdominal exercises involving the oblique muscles, which are connected with the rectus muscles via the fascia and have a common insertion - the linea alba<sup>40-42</sup>.

Lamaze classes and fitness clubs often offer special exercises for pregnant women. General fitness exercises are not protection against DRA. Banerjee et al., examining two groups of women performing pre-labour exercises enriched with exercises strengthening the abdominal muscles, demonstrated significant reduction in the risk of DRA compared to participation in systemic antenatal exercises<sup>43</sup>.

During visits, physical therapists most often use isolated exercises of the transverse abdominal muscle, pelvic floor muscles and the involvement of the transverse muscle in functional exercises during the training programme. During rehabilitation, they also use manual therapy including myofascial or trigger-point relaxation<sup>44</sup>.

Exercises introduced into the DRA rehabilitation programme should be performed under the supervision of a therapist who monitors the effectiveness of treatment. Often, the recommended transverse abdominal and pelvic muscle tension exercises can also increase IRD distance. In research, it has noted that one-time muscle tension of these muscle alone or in combination, increases IRD<sup>17,35,45</sup>. It is worth paying attention to whether the transverse muscle of the abdomen is tensed during a given exercise, e.g. trunk curl in supine position. When the transverse abdominal muscle is activated and the trunk curl is performed, the linea alba is less distorted than during the same curl without activation<sup>46,47</sup>.

### Indications for surgical treatment of rectus abdominis diastasis in pregnant and puerperium women

Indications for surgical treatment are: period at least one year after delivery, persistent pain in the pelvic girdle, urinary incontinence despite implementation of therapy, IRD greater than the norm and palpable abdominal contents. The operation is also recommended for overload dysfunctions. A positive Laseque test qualifies a patient for surgery, during which the effort to raise one's straightened leg is less when both parts of the rectus muscle are close. Passive integrity tests of the lumbar and/or pelvic intervertebral joints must be valid for a patient to be referred for surgery. The same also applies to tests of the nervous system<sup>16</sup>. Another indication for surgery is the simultaneous occurrence of symptomatic umbilical hernia, often associated with DRA. In the case of surgery, correction of both pathologies at the same time is recom-



**Figure 3**  
Head lift and shoulder-blades lifted off the ground, hands directed towards the knee joints – side view

**Table 1****Example training plan using Litos programme exercises<sup>27</sup>**

Exercise	Woman's position and instructions	Repetitions/series; additional information	Home exercise programme – instructions
Isotonic/isometric exercises of the local stabilisers: session 1-3			
TA activation in squatting position	W sits on the edge of a chair, the centre of gravity of the body falls on the ischial tuberosity, in this position, she tenses the transverse abdominal muscle of the abdomen, pulling the navel towards the spine.	10 x 10 s hold. The objective is conscious improvement of position and arrangement of the spine during sitting.	During the day, 1 repetition whenever the W sits down.
Progressive tension of PFM/Relaxation	W in a sitting position on a gym ball. W imagines „going up to the fifth floor in a lift” in order to submaximally tense the PFM. Then, the W repeats this tensing imagining „going down to first floor in a lift”. Subsequently, she repeats tensing the muscles imagining „going up floor by floor from 1 to 5” to later imagine „going down”.	3 repetitions of 5-floor tension/relaxation; W increases the number of repetitions to the maximum by the 4th week.	3 x 3 series up to 5 x 5 series a day.
Backbends	W in supine position, feet flat on the mat. W tenses the TA and elevates her hips. W maintains this position for 5 s and slowly lowers her hips onto the mat.	10 x 5 s to 25 x 10 s (during 7 sessions)	10 x 10 s
Isotonic/isometric exercises of the local stabilisers: sessions 4-10			
Forward-backward pelvic tilt	W in supine position, feet flat on the mat. W first tenses the TA, then lifts the pelvis so as to sustain the lordosis in the lumbar section of the spine and then successively, in the opposite direction. The W remembers to breath during the exercises and performs movement within a non-painful range.	20 x	Advanced version: in squatting position on a ball 20 x
Abduction in the hip joint	W in position as above. Pilates ring placed around flexed knee joints. W tenses the TA, putting pressure on the ring during exhaling.	10 x 5 holds up to 20 x 5 holds (during session 12).	
Rotation while laying on one's side	W lays on her side, knee joints are bent, ankle joints are connected. W tenses TA, then lifts knee in the direction of the ceiling, without disconnecting the feet. Movement occurs in the hip joints. W tries not to rotate pelvis.	10 x 5 s hold up to 20 x 5 s.	
Advanced isometric exercises of the local and global stabilisers with mobility improvement: sessions 11-18			
Walking on a treadmill	W instructed to maintain proper posture and tension of TA during the whole exercise.	10 min, cadence 2.5 m/h, without lift to 25 min, cadence 3 m/h (during session 17).	Recommended to start pushing the trolley to exceed the threshold of tolerance, aim: 30 min of walking, moderately advanced.
Squats on a Bosu ball	W stands on a Bosu ball, both LL positioned at the width of the shoulders, knee joints slightly bent, TA tensed, W holds a 1 kg dumbbell. During squat, W bends both LL limbs to 90°, lifting them in front of her, then maintains the squat for 5 s, and raises, lowering the dumbbell.	20 x 5 s; advanced version: using 4 kg dumbbell	
Advanced back-bend with elevating the lower limb	W in supine position, both LLs resting on a gym ball. W tenses the TA and lifts her hips, both ULs crossed on the chest. In position with elevated hips, W lifts extended LL, slowly lowering it and repeats this with the opposite limb. Hips return to the mat. W repeats the exercise sequence.	10 x both LL	
Abbreviations: PFM – pelvic floor muscle; W – woman; TA – transversus abdominis (transverse abdominal muscle); LL – lower limb; UL – upper limb			

mended to avoid their recurrence<sup>33,48</sup>. Another important factor for many women deciding to undergo surgical treatment is the aesthetic aspect. Unaesthetic appearance is caused by bulging in the midline of the body in the area of the navel<sup>33</sup>. It should be borne in mind that surgical treatment is associated with complications. The most common are: hematoma, local accumulation of serous fluid, wound infections, skin necrosis, scar hypertrophy. As a consequence of sutur-

ing the rectus abdominis, pressure increases, venous return decreases, and the risk of deep vein thrombosis increases. In addition, DRA recurrence may occur in 40% of pregnant and postpartum women<sup>49,50</sup>.

## CONCLUSIONS

Diastasis of the recti abdominis muscle can be preventively treated by introducing appropriate prophylaxis,

which aims to strengthen the transverse and the rectus abdominis muscles, and to learn the right posture and principles of proper performance of activities such as lifting heavy objects. In the event of diastasis during puerperium, its size can be reduced in a non-invasive manner or can even be completely eliminated after introducing appropriate exercises, being assisted with orthopaedic equipment if necessary. Exercises should be individually selected by a therapist and

performed under his/her supervision at the initial stage of training to teach the patient to properly activate the transverse abdominal muscle. Pregnant women who do not have contraindications to physical activity can reduce the risk of DRA by performing appropriate exercises.

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