

## Postoperative Nursing Care of a Patient Who Had the Jaten Procedure: A Newborn Case Report

### Abstract

Today, the Jaten procedure, which provides anatomical repair, is a frequently preferred method in the surgical treatment of transposition of the great arteries. This case report aimed to draw attention to the effect of the nursing care given in the postoperative period to the newborn who underwent the Jaten procedure, on the prevention of complications and the reduction of discharge time. In the case report, confidentiality and ethical principles were adhered to, and the written consent of the patient's legal guardian was obtained. The patient underwent the Jaten procedure, peritoneal dialysis was started, he was taken to extracorporeal membrane oxygenation, a pacemaker was inserted, and a tracheostomy was opened. The patient who left extracorporeal membrane oxygenation and peritoneal dialysis, whose pacemaker was turned off, and whose hemodynamics was stable, was taken to the service on the 59th post-operative day and was discharged with recovery 2 days later. Planning the nursing care and evaluating the results of the care for the problems experienced and may be experienced by the newborns undergoing the Jaten procedure are of great importance in preventing the development of complications in the patient and reducing the transfer time from the intensive care unit to the clinic.

*Keywords: Jaten procedure, postoperative nursing care, transposition of the great arteries*

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### Introduction

Congenital heart diseases (CHD) are the most common congenital anomaly in newborns. Its incidence ranges from about 0.8% to 0.9% of all live births, and an increase in the prevalence of CHD has been reported over the years.<sup>1</sup> Great artery transposition (TGA) is one of the most common cyanotic heart diseases in newborns and newborns.<sup>2</sup> It constitutes approximately 5%-7% of CHD and is more common in men (M/F ratio 3 : 1).<sup>3</sup> Great artery transposition is a malformation in which the 2 main arteries that carry blood to the organs are displaced. In this anomaly, the pulmonary artery, which should come out of the right ventricle and carry oxygen-poor blood to the lungs, comes out of the left ventricle. Therefore, defects that allow mixing of the pulmonary and systemic circulation such as atrial septal defect (ASD), ventricular septal defect (VSD), or patent ductus arteriosus (PDA) are essential for survival.<sup>3</sup> The most common anomaly accompanying TGA is VSD, and it can be seen in combination with pulmonary stenosis and tricuspid valve diseases.<sup>4</sup> Tricuspid regurgitation and systemic ventricular failure are seen as long-term complications when anatomical correction is not made to TGA.<sup>5</sup> Today, mustard and senning operations, which provide physiological correction at the atrial level, and arterial switch operations, which provide anatomical correction at the arterial level, are successfully applied in the surgical treatment of TGA. Due to the high morbidity and mortality of physiological correction surgeries in the late postoperative period, arterial switch (Jaten) surgery, which provides anatomical repair, was first applied in 1975 by Jatene et al<sup>7</sup>. This surgery has been the first choice in the surgical treatment of TGA in many centers because it provides anatomical correction, and long-term results are better than surgeries that provide atrial level correction.<sup>6</sup>

In pediatric cardiovascular surgery, information sharing among team members and coordination of the primary nurse responsible for the patient's care have a key role in achieving targeted results in a specific group with high complications and risks, such as the Jaten procedure. Planning the nursing care for the problems that these newborns live

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with and may experience and evaluating the results of care are of great importance in ensuring recovery and preventing complications. It is predicted that it will be possible to accelerate the recovery process and prevent repeated hospitalizations by providing individualized nursing care to newborns who have undergone Jatén procedure until their discharge from the intensive care unit.

This case report aimed to draw attention to the effect of individualized nursing care given to a patient who had undergone Jatén procedure in the postoperative period in preventing complications and shortening the discharge time. In the case report, the confidentiality principle was followed and ethical principles were adhered to. Written and verbal consent was obtained from the patient's legal guardian. The data were obtained by the researcher by using the nurses, physicians, and patient files working in the pediatric cardiac surgery intensive care unit (PCSICU), where newborns with heart disease between the ages of 0 and 18 receive care and treatment.

### Case Report

The patient, who was diagnosed with TGA during the intrauterine period and accompanied by PDA and ASD, underwent balloon atrial septostomy in a Training and Research Hospital when he was 2 days old and was transferred to another PCSICU by 112 air ambulances. Arterial switch (Jatén) surgery was performed when the patient was 4 days old. The patient who came out of the operation was sedated and taken to the PCSICU with multiple inotropic infusions, antihypertensive, antifibrinolytic, and diuretic infusions. The patient, who was mechanically ventilated in Synchronized Intermittent Mandatory Ventilation (SIMV) mode with 50% FiO<sub>2</sub> on the day of the operation, was followed up with an arterial catheter in the right femoral, central venous pressure (CVP) catheter in the right jugular, bilateral thoracic tube, foley catheter (6 Fr), and nasogastric tube (6 Fr).

The patient was transferred to the PCSICU with closed skin graft and open sternum. The patient's oral intake was closed and the nasogastric tube was taken to free drainage. Electrolytes were sent parenterally to the primene and as an infusion in 20% dextrose, according to the physician's order. Hourly blood gas, urine, and drain follow-up of the patient was performed, and sterile aspiration was applied every 2-3 hours. In order to keep the central venous pressure of the patient who was not found to have effusion on echocardiography, replacement was provided with fresh-frozen plasma (FFP) and erythrocyte suspension (ES) transfusion according to the physician's order.

After the primary care nurse of the patient who was hypotensive on the first postoperative day (post-op) informed the surgeon on duty, medical interventions were performed. After the interventions, he was taken to extracorporeal membrane oxygenation (ECMO) in the PCSICU with the indication of low cardiac output syndrome (LCOS) in the company of the operating room team. After the procedure, the peritoneal catheter was opened and peritoneal dialysis was started at 2 h/30cc. Antifibrinolytic infusion was terminated, and anticoagulant and albumin infusion was started in the patient who had no bleeding focus after being taken to ECMO. Hourly activated clotting time (ACT) was monitored.

On the second post-op day, the patient, whose arterial blood pressure follow-up was good, was revised by the physicians, and ECMO was stopped. Anticoagulant infusion of the patient whose ECMO was stopped was terminated. As a result of the evaluation of the drainage coming from the chest x-ray and the thoracic tubes by the

physicians, the left thoracic drain tube was removed during the revision and the peritoneal dialysis continued at a rate of 30 cc/30 cc for 6 hours since the urine output was good. Since a reaction developed in the patient who underwent ES during the replacement therapy, the patient began to desaturate and the transfusion procedure was terminated. The replacement therapy of the patient, for whom necessary interventions were made, continued with FFP and other products. In addition, the patient was prepared by washing the ES's in subsequent transfusion procedures. Antihypertensive infusion of the patient whose blood pressure was stable was terminated. In addition, plasma and diuretic infusions were discontinued.

On the third postoperative day, the patient's general edema did not decrease and diuretic infusion was started again at the request of the physician, and peritoneal dialysis continued at 30 cc/h for 3 hours. Pneumothorax (Px) was observed in the left thorax in the chest x-ray. On the fourth post-op day, the patient's sternum was revised, and the tube was inserted into the left thorax again during the revision as a result of the increase in Px.

On the fifth post-op day, since the drainage from the thoracic tubes was chylothorax, growth hormone inhibitors were started as an infusion and the patient was fed with a formula containing medium-chain fatty acids. Inotropic support was discontinued on the sixth and seventh days of the post-op period, upon the request of the physician, of the patient whose heart rate and blood pressure remained stable. Peritoneal dialysis continued at 4 h/30 cc on the sixth day of post-op and the patient whose general edema decreased on the ninth day of post-op was revised in the PCSICU and the sternum was closed. In addition, peritoneal dialysis was taken to free drainage and diuretic infusion was terminated. The sedation infusions were discontinued, with the plan to awaken the patient by the physicians.

On the tenth post-op day, the patient's peritoneal catheter and bilateral thoracic tube were removed. On the 15th postoperative day, the arterial catheter was removed and the blood pressure was monitored with a blood pressure cuff. Tracheostomy (3.5 no cuff) was performed for the patient who could not tolerate extubation and was repeatedly intubated on the 28th post-op day. On the 32nd post-op day, the patient was started to be followed with 40% FiO<sub>2</sub> continuous positive airway pressure (CPAP) mode in order to be weaned from mechanical ventilation (MV), and the continued prophylactic growth hormone inhibitor infusion was discontinued in terms of chylothorax. Extubation could not be performed on the patient who could not tolerate weaning, and the patient was started to be followed up with CPAP and T tube intermittently on the 38th post-op day at this weaning stage.

On the 39th post-op day, the patient's heart contraction was evaluated by the physician through echocardiography, and inotropic infusion was stopped. On the 40th post-op day, the patient was started to be followed up with distant inhalation and the patient was decannulated on the 44th post-op day. However, it was cannulated again because the patient could not tolerate it. Antiarrhythmic treatment was applied to the patient who had arrhythmia and bradycardia on the same day. When this treatment failed to yield effective results, a pacemaker was inserted in the VVI 80 sense mode by the physician for the patient with pacemaker wires.

On the 45th post-op day, the patient's holter result was evaluated. In the endotracheal aspirate culture taken from the patient,

Table 1. Individualized Nursing Care Applied to the Patient

Nursing Diagnosis and Etiological Factors	Nursing Interventions	Evaluation
<p><b>Disruption in breathing pattern</b> Immaturity of the lung Having a tracheostomy Being in the postoperative period</p>	<p>Daily routine tracheostomy dressing was performed. It was monitored for signs of infection. The secretion of the patient was observed in terms of color, consistency, content, and odor. Aspiration was performed when necessary. When there was hemorrhagic secretion, aspiration was performed with adrenaline. Tracheostomy dressing and aspiration were taught to the mother and positive feedback was given each time she did it. The symptoms of respiratory distress were explained to the mother and the newborn was followed up for respiratory distress. The mother was taught how to perform postural drainage by supporting the incision site and was encouraged to do it before each feeding. The mother was informed that increasing the newborn's fluid intake would soften the secretions and facilitate excretion. The newborn's head was elevated and the fowler position was given, and the position was changed intermittently every 2 hours. Bronchodilators were administered according to the physician's request.</p>	<p>No collapsed areas were observed in the lung x-ray. Retraction was not observed in the patient after decannulation, respiratory rate was between 30 and 50/min and was regular.</p>
<p><b>Decrease in cardiac output</b> Connecting to ECMO with the indication of cardiac output syndrome</p>	<p>Arterial blood pressure of the patient was monitored and followed up. When the blood pressure was low, replacement therapy (ES, FFP or voluven solution, etc.) was applied at the request of the physician. The presence of cardiogenic/hypovolemic shock and signs of decreased cardiac output were checked and recorded in the nurse observation form. Hourly activated coagulation time, intake-output follow-up and bilateral thoracic drainage follow-up were performed.</p>	<p>On the second post-op day, the patient with good arterial blood pressure (around 70-45 mmHg) left ECMO.</p>
<p><b>Fluid volume imbalance</b> Peritoneal catheter insertion and dialysis rotation for 10 days on the first post-op day</p>	<p>According to the patient's incoming drainage, the solution amount and hours of the peritoneal dialysis were adjusted in cooperation with the physician. Abdominal circumference and edema status of the patient were evaluated daily and recorded. Those coming from the bilateral thoracic tubes were followed up, and replacement therapy was performed when there was imbalance by following the intake-output. Biochemistry values were followed to evaluate daily kidney functions and electrolytes at the physician's request (blood urea nitrogen (BUN)=16 mg/dL, creatinine=0.69 mg/dL, albumin=40 g/L).</p>	<p>Biochemistry parameters and urine output were within the normal range when the patient was discharged.</p>
<p><b>Bleeding risk</b> Patient connected to ECMO Being in the postoperative period Presence of the incision site Presence of bilateral thoracic tubes</p>	<p>While on ECMO, anticoagulant and antifibrinolytic infusion doses were adjusted according to the order of hourly activated coagulation time. While the sternum was followed open, daily dressing was done by the physician and the incision site was observed by the nurse in terms of bleeding, opening, tearing, and evisceration. It was observed whether there were signs of shock and bleeding. Thorax tubes were evaluated in terms of quantity and content. Urine was monitored for color and quantity with a foley catheter. Tracheal aspiration content was evaluated for hemorrhage. Hemogram tests were repeated routinely. Pooled platelets, ES, and FFP were transfused according to the physician's request. Oral anticoagulant treatment was given during the PCSICU in consultation with the physician according to the laboratory results.</p>	<p>Unpreventable bleeding focus was not seen. At discharge, laboratory findings (active partial thromboplastin time test (aPTT)= 43 seconds, hemoglobin (HGB)=12.70 g/dL, hematocrit (HCT)=38%) were within normal limits.</p>
<p><b>Dysrhythmia</b> Being in the postoperative period Pacemaker is connected</p>	<p>The patient was followed by electrocardiogram (ECG) monitor. Arrhythmic therapy (arrhythmic slow IV push, magnesium infusion) was applied when arrhythmia and bradycardia were observed. When there was no effective result, a pacemaker was inserted by the physician in the pacemaker VVI 80 sense mode into the patient with pacemaker wires. The mother of the patient, who was followed up in pace-maker VVI 80 sense mode, was informed about the pace-maker battery alarm and notifying the healthcare personnel when the heart rate fell below 80/min. Signs of dysrhythmia and serum electrolyte levels were observed (sodium (Na)=136 mEq/L, potassium (K)=3.9 mEq/L, calcium (Ca)=9.10 mg/dL, magnesium (Mg)=1.85 mg/dL, chlorine (Cl)=107 mEq/L).</p>	<p>As the patient did not have long-term bradycardia, the patient's pacemaker was closed by the physician.</p>

(Continued)

Table 1. Individualized Nursing Care Applied to the Patient (*Continued*)

Nursing Diagnosis and Etiological Factors	Nursing Interventions	Evaluation
<p><b>Risk of infection</b>                      Presence of incision site                      Being in the postoperative period                      Immature immune system due to being a newborn</p>	<p>Antibiotics were administered to the patient, who developed vancomycin-resistant enterococci and klebsiella, at the request of the physician.                      The patient's room was revised in terms of isolation (contact isolation sign on the door of the room, no other patients are allowed in the room, etc.).                      The healthcare personnel and caregivers who entered the room for follow-up and treatment used protective equipment (aprons, masks, and bonnets), hands were washed before and after contact with the patient.                      Visitors were restricted and the mother was given isolation training.                      Rectal swab sample, blood culture, and routine blood tests were taken from the patient and followed up.                      CVP catheter was observed for signs and symptoms of infection (swelling, redness, and hematoma, etc.) and dressing was performed.                      The tracheostomy incision site was evaluated for infection at each dressing.                      Aspiration was performed in accordance with aseptic techniques.                      Fever was recorded at frequent intervals.</p>	<p>The patient's last control parameters were within normal limits (white blood cell=11.30 <math>10^3/\mu\text{L}</math>, C-reactive protein <math>\leq 0.2</math> mg/dL, procalcitonin=0.27 ng/mL blood culture, vancomycin-resistant enterococci, carbapenem growth was not observed).</p>
<p><b>Deterioration of skin integrity</b>                      Presence of incision sites                      Having catheters (foley, central venous, intravenous)</p>	<p>The importance of fluid intake and nutrition in the healing of scar tissues was explained to the mother.                      Incision sites (sternum, trachea, and thorax) and catheter sites (jugular vein/peripheral intravenous cannula site/abdominal peritoneal catheter) were monitored for possible infection or dehiscence.                      Sternum, thorax tube locations, and catheter dressings were performed in accordance with aseptic rules.                      Appropriate positions were given to the patient at intervals to prevent the formation of pressure sores.                      General body care was done and bed linen was changed daily.</p>	<p>Infection did not develop in areas with impaired skin integrity and no increase was observed in these areas.</p>
<p><b>Acute pain</b>                      Being in the postoperative period                      Exposure to painful procedures in the PCSICU</p>	<p>The severity of the newborn's pain was defined using the Neonatal Pain Diagnostic Scale.                      To distract the newborn, his favorite lullabies were played on the phone, and his interaction with his mother was supported.                      In the interventions, time was given for the newborn to calm down.                      When necessary, analgesics were administered according to the physician's request.</p>	<p>Acute pain was controlled.                      Neonatal Pain Diagnostic Scale was between 0 and 6 points.</p>
<p><b>Nutrition less than body requirement</b>                      Low weight compared to gestational week (3450 g)</p>	<p>According to the physician's request, <math>H_2</math> receptor antagonists and analgesics were administered to control retching and pain.                      Mothers were educated about breast milk, breastfeeding techniques, and breast milk storage conditions.                      The mother was supported to breastfeed her newborn.                      Information was given about the use of supplementary foods ordered for increased carbohydrate and protein requirements.                      Weight was monitored in the service at the same time every day.</p>	<p>The patient's body weight (<math>&gt;3</math> percentile) was low.                      Since the problem continued, she was discharged with supportive food.</p>
<p><b>Risk of electrolyte imbalance</b>                      Inadequate nutrition                      Receiving peritoneal dialysis                      Presence of thoracic tubes</p>	<p>Intake-output tracking was done.                      Peritoneal dialysis was performed at the request of the physician according to the follow-up.                      Vital signs, ECG changes, kidney function tests, and laboratory results were evaluated by the physician and nurse.                      The drainage of the thoracic tubes was recorded and the necessary replacements were made at the request of the physician.                      The patient was evaluated in terms of signs and symptoms that may occur in electrolyte imbalances (vomiting, tetany, seizure, tremor, decreased deep tendon reflexes, etc.).</p>	<p>No serious electrolyte imbalance developed.</p>

(Continued)

Table 1. Individualized Nursing Care Applied to the Patient (Continued)

Nursing Diagnosis and Etiological Factors	Nursing Interventions	Evaluation
<p><b>Disruption in parent-newborn interaction</b> The newborn receiving treatment in the PCSICU The mother's postpartum Expressing that the mother's fear and stress level is high due to the newborn's illness</p>	<p>Effective communication was established with the mother, enabling her to express her feelings, and solutions for the issues she had difficulties were discussed (giving her medication, applying postural drainage, feeding, aspiration, etc.). The mother was encouraged to participate in the care of the newborn and the newborn was taken care of together with the mother. The mother was included in the care after the newborn was tracheostomized in order to maintain the bond between mother and newborn. It was ensured that she was with her mother during the treatment and painful procedures. In the meantime, it was mentioned that making eye contact with the newborn and sensual contact can calm him down, and make him feel safe and that the mother's reactions significantly affect the newborn's reactions. After the painful procedures, the mother was allowed to take the newborn in her arms and give kangaroo care. The mother was informed that with sensual contact, the newborn can be calmed by smelling the mother's scent, feeling the heartbeat, and the importance of mother-newborn bonding will help the newborn's body temperature to be adjusted.</p>	<p>When she was discharged, the mother stated that she could take care of her newborn and that she was not afraid, and it was observed that the mother's care skills were sufficient in the care she gave to the newborn in the hospital.</p>
<p><b>Disruption in sleep pattern</b> Being in the postoperative period Detection of pain (Neonatal Pain Diagnostic Scale:13)</p>	<p>Pain, which adversely affected the sleep process, was controlled by applying analgesics according to the physician's request. Since the mother was in puerperium, she was allowed to have another companion to help care for the newborn. It was tried to be done without waking the newborn by paying attention to the timing of the follow-up and treatments that continued at night. Necessary explanations were given to the mother about the newborn's burping, feeding position, and lying position. In order for the newborn to fall asleep more quickly and comfortably, the mother was recommended to massage the newborn's back or abdomen.</p>	<p>Toward discharge, the newborn began to sleep with longer sleep periods. Neonatal Pain Diagnostic Scale was between 0 and 6 points.</p>

ES, erythrocyte suspension; ECMO, extracorporeal membrane oxygenation; FFP, fresh-frozen plasma; PCSICU, pediatric cardiac surgery intensive care unit; CVP, central venous pressure.

gram-negative and rectal swab sample results showed that vancomycin-resistant enterococci and carbapenem-resistant klebsiella were grown. Daily complete blood count and biochemistry values of the patient were followed and blood cultures and CVP catheter cultures were sent at regular intervals. Combined antibiotic treatments were administered to the patient and isolation measures were taken. The patient's CVP catheter day was followed up and changed every 15 days.

On the 47th and 48th days of post-op, aspiration training and postural drainage training were given to the mother of the patient by the primary nurse. On the 49th post-op day, the patient was transferred to the clinic with a CVP catheter in the right jugular to receive distant inhalation with tracheostomy and a pacemaker in 80 sense mode. The patient, who had respiratory distress on the 50th post-op day, was taken back to PCSICU with intercostal retractions and SPO<sub>2</sub> value falling below 65. He was followed intermittently on mechanical ventilation in 30% FiO<sub>2</sub> CPAP-SIMV mode.

On the 51st day of post-op, 98% was followed by distant inhalation, on the 57th day of the post-op, decannulation was tried on the patient, and when the patient tolerated it, he was started to be followed up with 40% FiO<sub>2</sub> high-flow humidified respiratory therapy. Pacemaker of the patient whose heart rate was within normal limits (110-130/min) was closed by the physician and antibiotic treatment was terminated. The patient, whose hemodynamics was stable, was admitted to the clinic on the 59th post-op day, and was discharged with recovery 2 days after routine chest x-ray, blood tests, and echocardiography were performed in the service. The individualized nursing care applied to the patient in this process is summarized in Table 1.

## Discussion

Great artery transposition, one of the most common cyanotic heart diseases, is the anomaly that causes the highest mortality in the first month of life. Mortality in patients without surgical correction is 30% in the first week, 50% in the first month, 70% in the first 6 months, and 90% in the first year.<sup>6</sup> Arterial switch surgery is the most preferred surgical treatment of TGA today. It is a suitable technique for coronary transfer and new large vessel reconstruction. The clinical results of this technique, in which the left ventricle is operated as a systemic ventricle, and anatomical improvement is achieved, are quite successful.

Since the left ventricle pressure and muscle mass decrease over time, performing the surgery shortly after birth increases the success rate.<sup>8</sup> Nurses, who are primary caregivers, have a great role in the post-op process of patients with TGA for whom surgical intervention results are positive. In addition to congenital heart disease, our patient needs a follow-up and care that requires special knowledge, skills, and experience, because he is a newborn, was connected to ECMO support, has a tracheostomy, has many different mechanisms such as peritoneal dialysis and permanent pacemaker. It is known that ECMO support can bring with it complications such as coagulation, thrombocytopenia, separation of the cannula, embolism, oxygenation deficiency, bleeding, neurological complications, organ failure, infection (especially mediastinitis), and metabolic problems.<sup>9,10</sup> It is important for nurses and other healthcare professionals to closely monitor the patient in order to detect complications in the early period. For this, it is indispensable to ensure the proper organization of post-op nursing care and personnel.<sup>11,12</sup> In this process, monitoring of the patient, bleeding control, pain control, adequate

sedation management, protection of skin integrity, reduction of the effects of inactivity, and adequate nutrition and infection control are required.<sup>9,13</sup>

This case report aimed to draw attention to the fact that when individualized nursing care is given to the patient who underwent the Jatén procedure, possible complications can be prevented, the transfer time from the intensive care unit to the ward and the discharge time can be reduced. Although serious complications developed in the case and the duration of intensive care was long, the complications were brought under control with a multidisciplinary care approach, and the patient was discharged.

## Conclusion

It is of great importance to plan, implement, and evaluate nursing care for the problems experienced and may be experienced by newborns undergoing Jatén procedure. It is an indication that close follow-up of the nurses responsible for the primary care of these patients, especially those who need advanced life support such as ECMO, mechanical ventilator, bleeding risk, dysrhythmia, and life-threatening complications is required. A family-centered approach is important in pediatric surgery because the patient undergoing surgery is a newborn. In addition, the formation of a secure bond between the mother and the newborn and the participation of the mother in the care are more essential. It is thought that qualified and individualized nursing care is important in order to prevent complications and unplanned return to the hospital in a specific area such as the pediatric cardiac surgery intensive care unit, to reduce the length of intensive care and hospital stay, and to increase the quality of life.

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**Informed Consent:** Written and verbal informed consent was obtained from both children who participated in the study and their parents.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – F.B., Ö.B.; Design – F.B., Ö.B., N.A.A.; Supervision – F.B., Ö.B.; Funding – F.B., Ö.B., N.A.A.; Materials – F.B., Ö.B., N.A.A.; Data Collection and/or Processing – F.B., N.A.A.; Analysis and/or Interpretation – F.B., Ö.B.;

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