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Case Report

Diastasis of Symphysis Pubis In 18-Years Old Female Patient Treated With Conservative Pelvic Binder: Case Report

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ABSTRACT

Background: Pelvic trauma is commonly associated with high-velocity force-like road traffic accidents and carries high rates of complications, including diastasis of the symphysis pubis. The diastasis of symphysis pubis prevalence rate has been reported at 13-16%. This case report aimed to review the effectiveness of conservative pelvic binders in diastasis of the symphysis pubis in the emergency setting.
Case Report: An eighteen years old female patient was referred to the Emergency Unit because of a motorcycle accident. She revealed worsening abdominal pain, unable to move both legs and swollen and bruised vulva. The patient is fully conscious, and the vital sign revealed low blood pressure of 89/56 mmHg. The AP pelvis X-ray showed diastasis symphysis pubis marked 3.87 cm wide. Immediate resuscitation was performed, stabilizing the pelvis using a conservative pelvic binder. X-ray evaluation showed surprisingly successful results as the symphyseal gap reduced to 0.66 cm.
Discussion: In this case, the symphyseal gap was >2.5 cm, indicating surgical treatment. Recent studies suggest conservative therapy has good outcomes in the symphyseal gap >2.5 cm. Considering the patient's young age and no comorbidities, it was assumed that the healing process would occur quickly, so conservative treatment was chosen first. However, further evaluation is still needed due to the limitation of the follow-up from the patient.
Conclusion: Conservative treatment using a pelvic binder called *gurita* is effective for emergencies with inadequate medical equipment.

Keywords: Diastasis; Symphysis pubis; Pelvic binder; Conservative; Road traffic accident

INTRODUCTION

The pelvis is a ring structure composed of the sacral bone, coccygeal bone, and innominate bones: the pubis, ischium, and ilium. The innominate bones merge anteriorly at the symphysis pubis, forming a ring structure that protects the blood vessels, nerves, urogenital organs, and rectum. Pelvic trauma, commonly associated with high-velocity force such as road traffic accidents, falls from height, and crash injury,[1] carries high rates of complications. These include serious head and chest injuries, liver or spleen injuries, bone fractures, urogenital injuries, and rarely diastasis of the symphysis pubis.[2] Diastasis of symphysis pubis has been reported in 13-16% of pelvic ring injuries.[1] Of 66 patients with pelvic ring injuries there is 6% of patients get diastasis of the symphysis pubis.[3] The mortality rate of pelvic ring disruptions with multiple injuries is 10-15 %, while the mortality rate due to abdominal injury is as high as 50%.[4] The management of diastasis symphysis pubis through surgical and con-

servative treatment. Adequate surgical fixation and stabilization are performed when the symphyseal gap is over 2.5 cm. The early noninvasive stabilization can use a pelvic binder, which in Indonesian terms is called *gurita*, to provide circumferential compression. Assessing the pelvic binder periodically is necessary if hemodynamic instability is present.[5] This case report aims to review the indications, outcomes, and complications of conservative treatment in the symphysis pubis diastasis.

CASE REPORT

An eighteen years old female patient weighing 55 kg was referred to the Emergency Unit of a tertiary hospital in a remote area of East Java with a previous history of road traffic motorcycle accident four hours ago before being administered to the hospital. She revealed worsening abdominal pain and could not move both legs due to pain. The mechanism of injury was not yet known, as she fainted during the accident, and there were no witnesses. She was taken to the nearest public health center before hospital admission but received no medication or intervention.

The vital sign on admission revealed poor clinical condition, Glasgow Coma Scale E4V5M6, blood pressure 89/56 mmHg, respiration rate 20 breath/minute, heart rate 105 beat/minute, oxygen saturation 98%, and peripheral perfusion was warm. Clinical examination of the head, chest, and upper extremities was all normal. Both of the palpebral conjunctiva were pallor, pain during abdominal palpation was presented specifically in the suprapubic region, skin abrasions were found in the right inner thighs, the open wound was not present, deformity of the hip and legs were not present, swollen and bruised was present in the vulva. Blood in the external urethral meatus was not present.

The supine and left lateral decubitus abdominal X-ray demonstrated normal results, with no air in the abdominal cavity. The anteroposterior (AP) view of the pelvis X-ray showed diastasis symphysis pubis marked 3.87 cm width, no fracture line in pelvic or pubic bone was found, both sacroiliac (SI) joints were normal, and both of the acetabula were normal (Figure 1). Results of routine admission laboratory tests are shown in Table 1.

Immediate resuscitation was performed in the Emergency Unit by placing a double intravenous access line, giving 1000 ml crystalloid fluid resuscitation, and inserting a urine catheter. The pelvic bone was stabilized by internally rotating the hip and fixed using a conservative pelvic binder which in Indonesian terms is called *gurita* (Figure 2). Both of the toes were also tied up to strengthen the fixation. The patient's vital signs improved after resuscitation, blood pressure 102/58 mmHg,

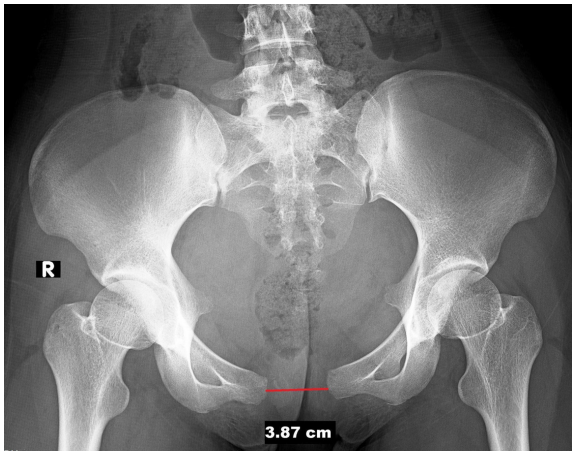

Figure 1. Diastasis of symphysis pubis marked 3.87 cm width

Figure 2. In this case, the conservative pelvic binder is a sheet wrapping cloth with many straps on the front side that looks like an octopus' tentacles (in Indonesian terms is called *gurita*) to stabilize the diastasis of the symphysis pubis.

Table 1. Laboratory test

Laboratory Result	Reference Values
Haemoglobin 10.4 g/dL	12.5 - 16 g/dL
Erythrocytes 3.4 million cells/µL	4.2 – 5.4 million cells/µL
Hematocrit 31%	35 – 47%
Leucocyte 18100/µL	4500 – 11000
Eosinophils 0%	1 – 3%
Basophils 0%	0 – 1%
Neutrophils 86%	50 – 70%
Lymphocytes 10%	20 – 40%
Monocytes 4%	2 – 8%
Thrombocytes 323000/µL	150000 – 450000/µL
Bleeding Time 2 minutes	1 - 5 minutes
Clotting Time 7 minutes	5 - 10 minutes
Serum Creatinine 1.19 mg/dL	0 – 0.9 mg/dL
Ureum 30 mg/dL	18 – 49 mg/dL
Blood Urea Nitrogen (BUN) 14 mg/dL	8 – 22 mg/dL
Uric Acid 3.7 mg/dL	2.6 – 6 mg/dL
Serum Glutamic Oxaloacetic Transaminase (SGOT) 62 U/L	< 31 U/L
Serum Glutamic Pyruvic Transaminase (SGPT) 46 U/L	< 35 U/L
Blood Glucose 92 mg/dL	< 200 mg/dL

respiration rate 20 breath/minute, heart rate 92 beats/minute, and oxygen saturation 98%. The initial urine volume was 175 ml, clear yellow, and the urine production an hour after fluid resuscitation was 250 ml. X-ray evaluation after applying a conservative pelvic binder was also performed, and the result was surprisingly successful, as the symphyseal gap was reduced to 0.66 cm. (Figure 3). The patient was sent to the Intensive Care Unit (ICU) for further intensive observation and therapy. 200 ml blood transfusion was given in the ICU as the hemoglobin level decreased to 8.9 mg/dL. After the blood transfusion, the hemoglobin level was checked periodically, and the result was 9.8 mg/dL right after the transfusion and 10.3 mg/dL on the next day. On the 5th day of hospitalization, the patient was transferred to the wardroom as the clinical condition improved. The total days of hospitalization were seven days.

In addition to monitoring the patient's outcome from her visit to the orthopedic out-

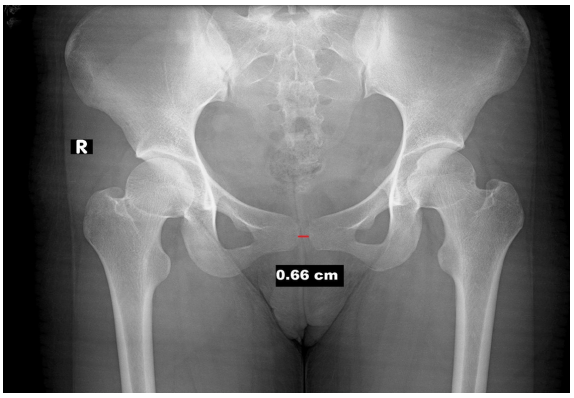

Figure 3. X-ray evaluation after placing a conservational pelvic binder, the symphyseal gap reduced to 0.66 cm.

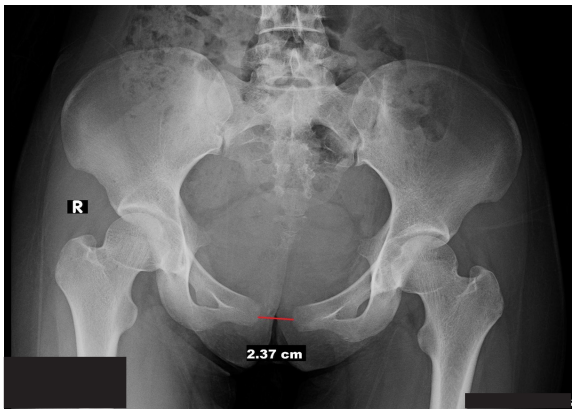

Figure 4. Patient non-compliance in using pelvic binder leads to widening the symphyseal gap marked 2.37 cm width in the AP pelvic x-ray.

patient clinic, a home visit was also carried out. The patient revealed that she could sit from a supine position on the second day after hospitalization, and now she could sit for a longer time, but sometimes the pain was felt around the left inguinal region. Knee flexion, dorsiflexion, and plantar flexion were normal in both feet. Sensoric sensations in the perineum, thighs, lower legs, and feet were normal. Urination was normal, but constipation occurred on the tenth day after hospitalization, and it was getting better after she got laxatives and ate more vegetables and fruits. The current condition revealed that she could stand up and walk slowly. Patient non-compliance with using a pelvic binder leads to widening the symphyseal gap marked 2.37 cm width measured in the AP pelvic x-ray (Figure 4). An explanation was given regarding the next treatment plan, whether surgical or continuing conservative treatment considering the symphyseal gap was less than 2.5 cm. The patient still chose to continue the conservative treatment. The treatment compliance and long-term complications, including persistent pelvic pain also a higher risk of re-experiencing diastasis of the symphysis pubis during vaginal delivery, had been informed. Written informed consent was obtained from the patient to publish the current case report and any accompanying images.

DISCUSSION

Symphysis pubis is a fibrocartilaginous joint sandwiched between the right and left superior pubic rami, and each end of those bones is coated by hyaline cartilage. Fibrocartilage is primarily composed of type I collagen and has a densely braided arrangement of cartilage fibers suitable for its function to withstand heavy loads. Four ligaments are attached to the fibrocartilage disk to keep it from slipping or moving more than it should. The inferior pubic ligament provides most of the joint's stability and is supported by the superior, anterior, and posterior pubic ligaments. Symphysis pubis can still occur with limited movement, so it is functionally classified as a non-synovial amphiarthrodial joint.[6,7] Symphysis pubis and the posterior SI joints create the pelvic ring. They are responsible for the rotational movement and expansion of the pelvis and provide support to the pelvis during axial loading.[8]

Diastasis of the symphysis pubis is one type of pelvic injury reported in 13–16% of pelvic ring injuries. Diastasis of the pubic symphysis is usually caused by high-force trauma such as road traffic accidents, falls from a height, and crush injuries. Other less common causes include secondary to radiotherapy, pregnancy, infection, and several metabolic and congenital abnormalities.[1] The mortality rate of pelvic ring disruptions with multiple injuries is 10-15 %, while the mortality rate due to abdominal injury is as high as 50%.[4]

The diagnosis is based on clinical signs, physical examination, and radiological findings. The most common clinical signs are a pain in the symphysis and SI joint and a waddling gait can be found in some cases. The results of physical examination related to the diagnosis are tenderness in the particular joint area on palpation, positive Patrick's/Faber test, and positive Trendelenburg sign that shows the highest sensitivity. A joint widening of > 10 mm/1 cm, measured in AP pelvis X-ray, is diagnostic criteria and defined as pathological diastasis.[8] Anterior separation of more than 2.5 cm progressively causes injury to the posterior pelvic ring, including disruption of the SI joint or sacral fractures.[3] Other imaging methods such as ultrasound, CT scan, and MRI can be performed for diagnostic confirmation.[9]

The two common classifications in pelvic fracture are the Young & Burgess classification and the Tile classification. The Young & Burgess classification classified the types of pelvic fractures based on their mechanism of injury that can predict the severity of the injury. It is

divided into four groups; Anteroposterior Compression (APC I - symphysis widening < 2.5 cm; APC II - symphysis widening > 2.5 cm with the anterior widening of SI joint; APC III - symphysis widening > 2.5 cm with the dislocation of SI joint), Lateral Compression (LC I - pubic rami fracture with ipsilateral anterior sacral wing fracture; LC II - pubic rami fracture with ipsilateral posterior ilium fracture dislocation; LC III - ipsilateral lateral compression and contralateral APC pattern injury), vertical shear (VS), and combined (CM). The tile classification classified the stability of pelvic fracture that can determine whether it needs surgical or conservative treatment. It is divided into three groups; stable, partially stable, and unstable.[5] However, these two classifications cannot determine hemodynamic stability. A classification by the world society of emergency surgery (WSES) could determine the anatomic fracture classification and the patient's hemodynamic stability; choosing the right treatment algorithm is useful. The WSES classification is divided into mild, moderate, and severe categories. Mild: WSES grade I (APC I and LC I fractures) - the fracture is stable, and the patient is hemodynamically stable; Moderate: WSES grade II (APC II, APC III, and LC II, LC III fractures) and grade III (VS and CM fractures) - the fracture is unstable, but the patient is hemodynamically stable; Severe: WSES grade IV - any fracture pattern in a hemodynamically unstable patient.[2] In this presented case, the mechanism of injury is anteroposterior compression. Although we cannot gain accurate information from anamnesis, it can be known from the bruised and swollen vulva and diastasis of symphysis pubis marked 3.87 cm width in X-ray that indicate an anteroposterior compression. In this case, the symphyseal gap is 3.87 cm without anterior widening of the SI joint nor dislocation of the SI joint, so included in the APC II classification. The fracture is stable, but the patient's hemodynamic is unstable, so generally included in WSES grade IV.

There still need to be fully agreed guidelines for selecting the treatment modality. Still, in some literature, it is mentioned that the surgical treatment is performed when the symphyseal gap is more than 2.5 cm, five this is due to a separation of the symphysis pubis >2.5 cm causing progressive injury to the posterior pelvic ring from minor injuries such as SI joint disorders to sacral fractures.[8] Surgical treatment performed with open reduction and internal fixation.[5] Conservative treatment in the form of medication or pelvic binder that does not improve in 1-1.5 months is an indication for surgery. Other indications for surgery are if complications are found in nerve compression, urogenital trauma, or massive bleeding. However, recent studies suggest conservative treatment has a good and efficient outcome in cases with a symphyseal gap >2.5 cm.[8] No surgery was performed considering the patient's young age, and no comorbidities were found. The healing process was assumed to occur quickly, so the conservative treatment was chosen first. Diastasis of symphysis pubis disrupts the ligaments that hold the right and the left pubic bone. The healing process is affected intrinsically by the individual character, such as age, gender, race, health status, and nutrition. After an injury, soft tissue structures undergo a natural healing process through overlapping phases divided into hemorrhagic, inflammatory, proliferative, and remodeling phases.[10] Aging process disrupts any phase of wound healing and leads to a delay of 20-60%. Older people have a slower healing process as the inflammatory and proliferative response is delayed. Also, the collagen formed from the remodeling phase has a lesser quality. Sex hormones such as estrogen, androgen, and the steroid precursor dehydroepiandrosterone are important in wound healing. Female reproductive hormones, estrogen, and dehydroepiandrosterone speed up wound healing by attenuating inflammation and promoting extracellular matrix deposition. Meanwhile, androgen, the male reproductive hormone, has the

opposite effect.[11] The response to injury of each ligament is also different due to the differences in intrinsic fibroblast, the mechanical environment, intra-articular versus extra-articular environment, blood supply, and the degree of inflammatory response. There is no direct blood supply through the ligaments, so nutrition depends on the diffusion process in the surrounding tissues. Synovial fluid provides better nutrition diffusion to the ligaments attached to the articular synovial joints. Symphysis pubis is a non-synovial amphiarthrodial joint, so the ligaments disruption in the diastasis of the symphysis pubis is believed to have a slower and more limited healing response due to a slower metabolic rate.[10] The remodeling phase begins two to three weeks after the onset of injury and can last for more than a year.[12]

Some countries routinely use pelvic binders in suspected cases of pelvic injury. The pelvic binder effectively closes and temporarily stabilizes pelvic volume because it is applied in line with the greater trochanter of the hip, not the iliac crest, so the hip is internally rotated, making a compression effect that can reduce the pelvic volume. Monitoring the application of pelvic binders is carried out regularly, especially in the first 24 hours. If there are no signs of hemodynamic instability, the pelvic binder is removed, and the injured area is examined. The side effects of applying tight pelvic binders for a long duration are pressure, skin necrosis, and pain because the hemipelvis is too internally rotated. The advantages of a sufficiently tight pelvic binder outweigh the side effects. As the pelvic volume is reduced, massive blood loss can be overcome.[5] In this case, prolonged hospital admission from the accident location affects the amount of blood loss. By continuing the application of pelvic binder accompanied by fluid resuscitation and 200 ml blood transfusion, the hemoglobin level increased to 9.8 mg/dL right after transfusion and 10.3 mg/dL on the next day. The conservative pelvic binder used in this presented case is a sheet wrapping cloth with many straps on the front, so it looks like an octopus' tentacles (in Indonesian terms is called *gurita*). Originally the *gurita* is used in post-delivery women to help tighten the stomach tone after pregnancy. It has no hard materials framework, so the risk of pressure skin necrosis due to long-term use can be minimized.

The therapeutic outcomes can be assessed with clinical scoring and radiological scoring. The Majeed Score is the commonly used clinal scoring which assessed five aspects: pain, standing, sitting, sexual intercourse, and work performance. The total score of Majeed Score is 100, which is graded as excellent (>85), good (70-84), fair (55-69), or poor (<55).[13] A study by Meccariello L et al. (2022) proposed a new clinical scoring that better evaluates pain, work, sexual possibilities, sexual satisfaction, balance-sitting-walking, and psychological status of pelvic injuries. It can improve preoperative planning and subsequent rehabilitation and psychological support, which affect the quality of life more than other diseases.[14] Radiological scoring is scoring that determines the gap of the symphysis pubis, divided into excellent (0-5 mm / 0-0,5 cm), good (6-10 mm / 0,6-1 cm), fair (11-15 mm / 1,1-1,5 cm) and poor (>15 mm / > 1,5 cm).[15] In this patient, the Majeed Score and the new clinical scoring cannot be assessed because sexual intercourse, sexual possibilities, and sexual satisfaction cannot be evaluated as the patient has not married yet. In addition, premarital sex is not allowed in the cultural or religious system of the society here. The radiological scoring showed a good outcome as the symphyseal gap reduced from 3.87 cm to 0.644 cm on AP pelvic X-ray evaluation after applying the pelvic binder. A re-evaluation of AP pelvic X-ray was also performed on the twenty-fifth day after hospitalization. Patient non-compliance with using pelvic binder leads to widening the symphyseal gap marked 2.37 cm wide, indicating poor radiological scoring. Ideally, the pelvic binder must

be maintained minimally for 1-1.5 months due to recovery from the symphyseal rupture can be expected within six weeks.[8]

The most common complication of pelvic injury is bladder and urethral injury, which then becomes a stricture. Nerve injury also can occur due to trauma or post-surgery, especially L5 and S1. Long-term complications from prolonged conservative therapy include nonunion of the pubic ramus but are sometimes asymptomatic.[5] The pelvic floor muscles injury also can occur, while one function is to hold the organs in it, such as the anal sphincters and urethra. Thus causing bowel and bladder control impairment resulting in constipation, urine retention, incontinentia alvi, and incontinentia urine.[16] In this patient, motoric and sensory functions from the lumbosacral plexus were normal. Constipation on the tenth day after hospitalization could not be ascertained due to autonomic function impairment. It occurred temporarily and improved after the patient got laxatives and ate more vegetables and fruits.

There were a few potential limitations to our study. It was a single-center experience and only reflected local patient characteristics, so the unmeasured or unknown variables may be responsible for the patient's outcome. Ideally, a follow-up examination for up to 3-6 months is needed to determine the effectiveness of using a conservative pelvic binder. Still, the patient had dropped out of the orthopedic outpatient clinic after two months. We were unable to contact the patient regarding follow-up after they dropped out. However, there is still a need for further evaluation due to the limitation of the follow-up from the patient.

CONCLUSION

This case involved a conservative approach to managing diastasis of the symphysis pubis and demonstrated the importance of prompt assessment of the patient's clinical condition to optimize her recovery. In this patient, treatment with *gurita* is quite effective for emergencies with inadequate medical equipment.

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