Original Research Article

Pelvic Fracture as a Risk Factor for Posterior Urethral Rupture in Patients at dr. Moewardi Hospital

ABSTRACT

Introduction: Urethral rupture is a common complication in patients with pelvical fracture. With incidences 3-25% in patients with pelvical fracture.
Objective: To know the profile and analytical of pelvic fracture as a risk factor for posterior urethral rupture at dr. Moewardi Hospital Surakarta, January 2012 - December 2018
Methods: We conducted an analytic retrospective study on the medical records of patients with pelvic fracture and posterior urethral rupture for 7 years at dr. Moewardi Hospital Surakarta, from January 2012 to December 2018. Data we've taken from the in-patient medical records at Dr. Moewardi Hospital, which included age, pelvic fracture type and posterior urethral rupture.
Results and Discussion: A total of 48 patients with pelvic fracture, 25 patients (52%) found with posterior urethral rupture. 14 patients (29%) were in the age range 20-30 y.o. and fond that single rami fracture are the most common pelvical fracture with 19 patients (40%), single rami fracture are the most pelvical fracture that lead to posterior urethral rupture with 11 patients (odds ratio 1,47). Based on our data, the type of pelvic fracture most at risk of causing urethral rupture is single ramus pubis fracture followed by Ipsilateral ramus fracture. In stable pelvic fractures, urethral disruption can occur when a large force causes the fracture of 2 two or four pubic ramus (straddle) causing the butterfly fragment to be pulled back along with the prostate tissue fixed to the pubic bone. The force of this pull causes disruption of the urethra pars membranacea.
Conclusion: Single ramus fracture was the most pelvical fracture that lead to posterior urethral rupture in dr. Moewardi Hospital Surakarta

Keywords : Urethral rupture,Posterior urethreal rupture, Pelvical fracture, Singel Rami

1. INTRODUCTION

Urethral injury is a common complication of pelvic trauma that, if undiagnosed, can cause significant long-term morbidity. The urethral segment adjacent to the pubic rami and the puboprostatic ligament is particularly vulnerable. Urethral injury is a common complication of pelvic trauma and can occurs in as many as 24% of adults with hip fracture. Posterior urethral rupture occurs in about 3.5% - 19% in men. Urethral rupture varies from urethral stretch (25%), partial rupture (25%) and total rupture (50%).[1,2]

There are various classifications of pelvic fractures that exist and are very complex. Letournel and Judet's anatomical calcifications describe areas where pelvic bones typically fracture and are useful for categorizing fractures anatomically (Fig 9) but do not provide an overview of the mechanism of injury.[1,4]

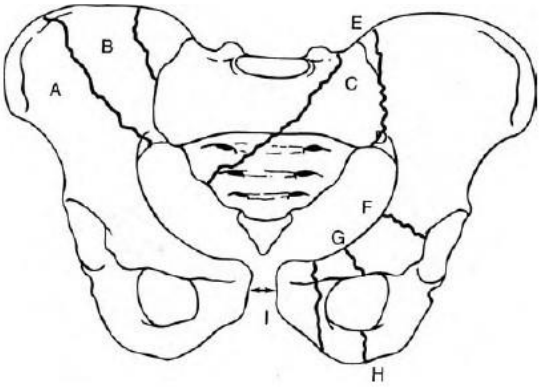


Figure 9 Letournal and Judet classification of pelvic fractures is an anatomic description. A, iliac wing fracture; B, ilium fracture with extension to the sacroiliac (SI) joint; C, transsacral fracture; D, unilateral sacral fracture; E, SI joint fracture-dislocation; F, acetabular fracture; G, pubic ramus fracture; H, ischeal fracture; I, pubic symphasis separation. This classification is useful for listing various fracture types, and numerous combinations of these fractures can occur. However, this classification does not connote information regarding mechanism, thus the Young and Burgess classification (Fig. 10) is preferred. *Source*: From Berquest.

An understanding of the fracture pattern and mechanism of injury is essential. Young and Burgess described a classification based on the mechanism of injury. This system was designed to give the traumatologist a predictor of other serious accompanying injuries to the pelvis and abdomen.[4]

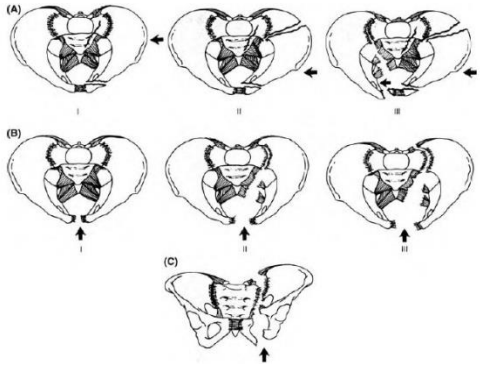


Figure 10 Young and Burgess classification of pelvic fractures. (**A**) Lateral compression force. Type I: a posteriorly directed force causing a sacral crushing injury and horizontal public ramus fractures ipsilaterally. This injury is stable. Type II: a more anteriorly directed force causing horizontal pubic ramus fractures with an anterior sacral crushing injury and either disruption of the posterior sacroiliac (SI) joints or fractures through the iliac wing. This injury is ipsilateral. Type III: an anteriorly directed force that is continued and leads to a type I or type II ipsilateral fracture with an external rotation component to the contralateral side; the SI joint is opened posteriorly, and the sacrotuberous and spinous ligaments are disrupted. (**B**) Anteroposterior (AP) compression fractures. Type I: an AP-directed force opening the pelvis but with the posterior ligamentous structures intact. This injury is stable. Type II: continuation of a type I fracture with disruption of the sacrospinous and potentially the sacrotuberous ligaments and an anterior SI joint opening. This fracture is rotationally stable. Type III: a completely unstable or vertical instability pattern with complete disruption of all ligamentous supporting structures. (**C**) A vertically directed force or forces at right angles to the supporting structures of the pelvis leading to vertical fractures in the rami and disruption of all the ligamentous structures. This injury is equivalent to an AP type III or a completely unstable and rotationally unstable fracture. *Source*: From Young JWR, Burgess AR. Radiologic Management of Pelvic Ring Fractures. Baltimore, Munich: Urban & Schwarzenberg, 1987.

The most common injury is the posterior urethra. These injuries occur in 3% -25% of patients with hip fractures. This urethral injury or rupture can cause significant long-term morbidity. Strictures have been reported in 31% -69% of patients after complete obstruction of the bulbous urethra. Incontinence and impotence are other well-known related problems. The severity and duration of these complications can be reduced if urethral injury is diagnosed and treated promptly.[4]

Different types of pelvic fractures cause posterior urethral rupture with different odds ratios. This difference in odds ratio is an interesting thing to do statistical data analysis that can predict the risk of urethral rupture if certain pelvic fractures are obtained.[5,6]

Currently, there is no recent data on pelvic fractures that cause posterior urethral rupture in RSUD Dr. Moewardi Surakarta. The latest data from other hospitals in Indonesia have also not been published. The 2012 EAU guideline states that pelvic fracture is a risk factor for posterior urethral rupture with different odds ratios for each type of fracture. This study will reveal the types of pelvic fractures which are risk factors for posterior urethral rupture in male patients who are admitted to Dr. Moewardi for 7 years.

Pelvic fractures in this study were divided into single ramus pubis fractures, ipsilateral ramus pubis, four ramus pubis, and Malgaigne's (vertical shear) fractures. This division refers to the 2012 EAU Guidelines and is based on cases found in male patients at Dr. Moewardi Surakarta in 2012-2018. In this study, the risk factor for urethral rupture or urethral rupture studied was felvic fracture. All data for pelvic fractures with posterior urethral rupture and pelvic fracture without urethral rupture were collected and odds ratios were calculated.

2. METHODS

This study is a retrospective analytical study. Male patient who experienced pelvic invoice with or without posterior urethral rupture at RSUD Dr. Moewardi Surakarta from January 2012 - December 2018The data taken were age, type of pelvic fracture, and urethral rupture. The inclusion criteria in this study were male pelvic fracture patients with or without posterior urethral rupture who were hospitalized and patients with pelvic fractures in question were fractures of the single ramus pubis, ipsilateral ramus pubis, four ramus pubis, and Malgaigne's (vertical shear). Patients with anterior urethral rupture were not included in this study.

The research data obtained were analyzed by calculating the odds ratio for the type of pelvic fracture and urethral fracture. Odds Ratio to estimate the level of risk between the dependent and independent variables. After that the results of data analysis will be presented in the form of tables, diagrams, pictures and narrative.

3. RESULT AND DISCUSSION

During the period January 2012 to December 2018, there were 48 male patients who had pelvic fractures and met the inclusion criteria at Dr. Moewardi Surakarta. Of the 48 patients, there were 25 patients (52%) who had pelvic fractures and urethral rupture who met the inclusion criteria in the sample of this study.

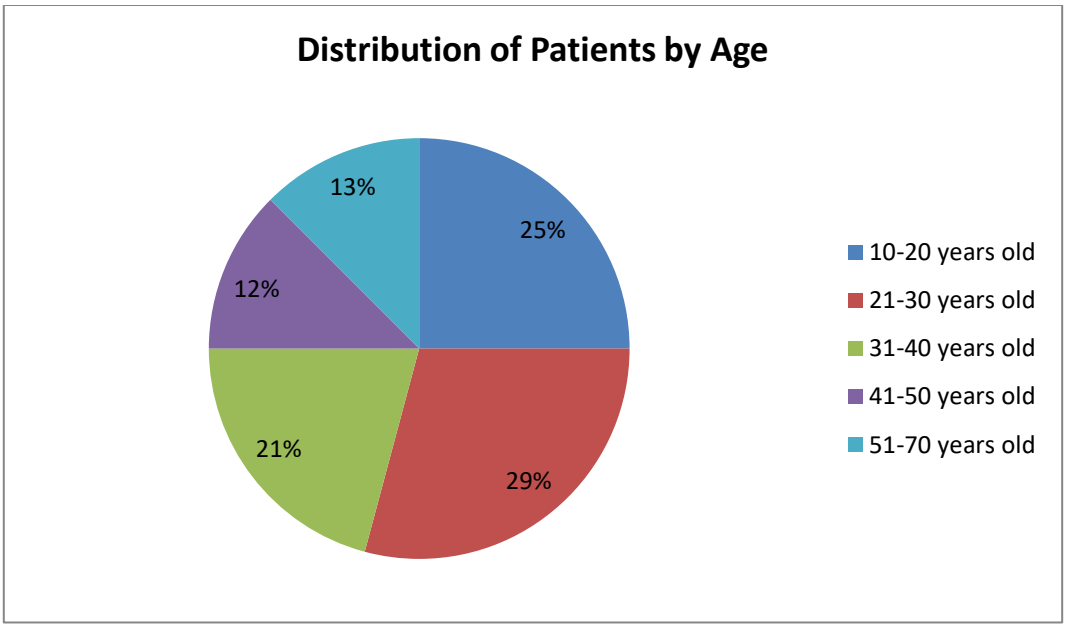


Fig 1. Patient Distribution Diagram by Age

From these data, it was found that the patient's age ranged from 10 to 20 years, 12 patients (25%), 21-30 years, 14 patients (29%), 31-40 years 10 patients 30 (21%), 41-50 years 6 patients (12 %,) and 51 - 70 years 6 patients (13%).

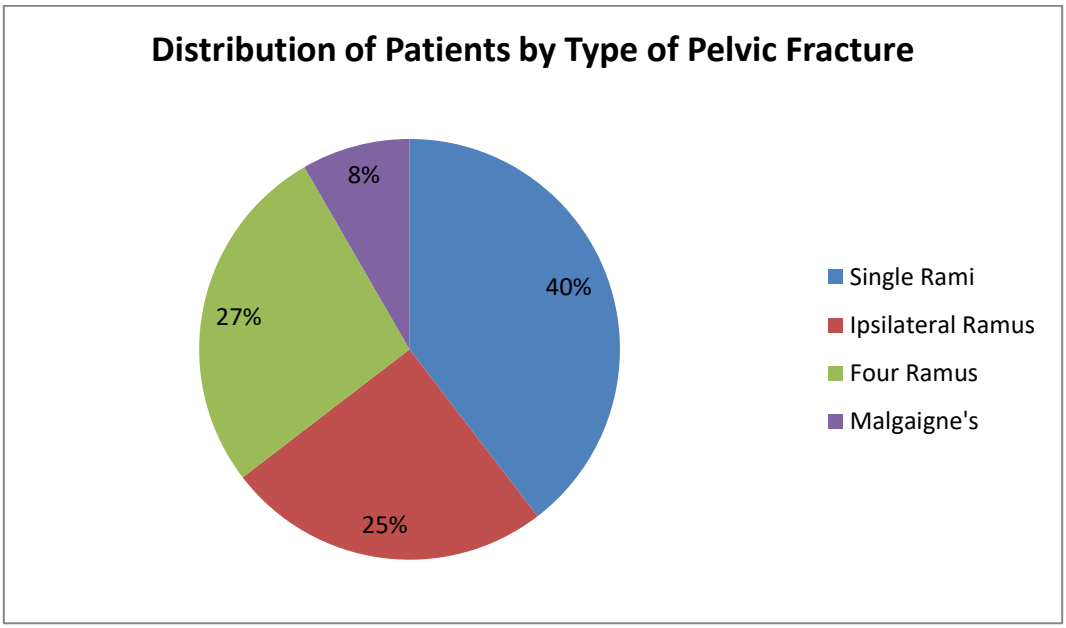
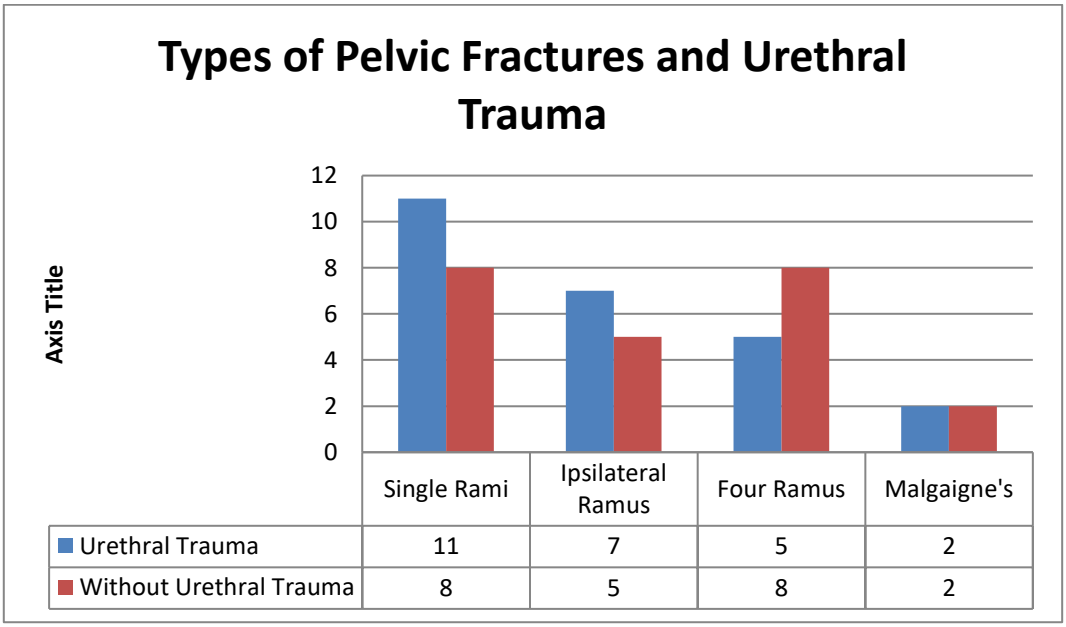


Figure 2. Patient Distribution Diagram by Type of Pelvic Fracture

From the table below, it was found that 19 patients with single ramus pubis fracture (40%), 12 ipsilateral ramus pubis (25%), 13 patients (27%), and Malgaigne's 4 patients (8%).



	Single Rami	Ipsilateral Ramus	Four Ramus	Malgaigne's
Urethral Trauma	11	7	5	2
Without Urethral Trauma	8	5	8	2

Figure 3. Diagram the Types of Pelvic Fractures and Urethral Trauma

From these data, 25 patients (52%) had pelvic fractures with urethral rupture and 23 (48%) without urethral rupture.

From the calculation of the odds ratio for each type of pelvic fracture, it is obtained as follows:

Type of pelvic fracture Odds Ratio 95% CI

1. Single rami: 1,47
2. Ipsilateral ramus : 1,4
3. Four ramus : 0.46
4. Malgaigne’s : 0,91

Single ramus fracture had the highest odds ratio (1.47), followed by Ipsilateral ramus fracture (1.4), Malgaigne's fracture (0.91), and Four ramus fracture (0.46).

Based on data obtained at the Moewardi Hospital in Surakarta during 2012-2018, it shows that patients who experienced pelvic fractures with posterior urethral rupture were mostly found at the age of 21-30 years (29%) and at least 41-50 years (12%). This may be because at that age is the productive age with the intensity of activities and driving on the road more. Basen on the 48 cases of pelvic fracture, 25 (76%) had urethral rupture. The risk ratio of various types of pelvic fractures to the incidence of urethral rupture was calculated using odds ratios. Each type of pelvic fracture is compared with other types of pelvic fractures that are likely to result in urethral rupture. In this study, the single ramus pubis fracture was found to have the highest risk of posterior urethral rupture with an odds ratio of 1.47, following Ipsilateral rami fracture of 1.4, Malgaigne fracture of 0.91, and Four rami fracture of 0.46. An odds ratio <1 means that Four hemp and Malgaigne's fractures are not a risk factor for posterior urethral rupture.

Based on our data, the type of pelvic fracture most at risk of causing urethral rupture is single rami pubis fracture followed by Ipsilateral ramus fracture.

This study did not separate stable and unstable pelvic fractures. Theoretically, both fracture type can cause urethral rupture. In stable pelvic fractures, urethral disruption can occur when a large force causes the fracture of 2 two or four pubic ramus (straddle) causing the butterfly fragment to be pulled back along with the prostate tissue fixed to the pubic bone. This tensile force causes disruption of the urethra pars membranacea.[7,8,9]

In unstable pelvic fractures involving the anterior pubis and SI joint, ilium, or sacrum can also cause posterior urethral rupture due to distortion of the pelvic bones in severe trauma or the presence of bone fragments directly into the urethra. This

pelvic distortion causes lateral shearing forces, but the puboprostatic ligament and urethra pars membranacea are pulled in the opposite direction.[10]

4. CONCLUSSION

Single rami fracture and Ipsilateral ramus are risk factors for incidence causing posterior urethral rupture in male patients hospitalized in Dr. Moewardi Surakarta in 2012-2018. Fracture of four rami and malgaigne's pubis are not a risk factor for posterior urethral rupture. This data may not show the true conclussion in the wider population so that studies with a larger number of samples are needed so that the results of the study can be stronger to find a relationship between pelvic fractures and the incidence of posterior urethral rupture.

REFERENCES

1. Margaret L, Pearle S, Yair L. Pelvic Fracture Urethral Injury. In: Campbell MF,
2. Martinez Pineiro L: Urethral Trauma. In : Emergencies of Urology. 2004; 328: 276-290.
3. Walsh PC, Retik AB, Vaughan ED, Wein AJ. Campbell's Urology 10th ed. Vol 3, WB Saunders 2011:2262-2694
4. Chapple C, Barbagli G, Jordan G, Mundy AR, Rodrigues-Netto N, Pansadoros V, McAninch JW. Consensus on Genitourinary Trauma. *BJUI*. 2004 ; 93 : 1195-1212
5. Malikandan R, Dorairajan LN, Kumar S JK, Current concepts in the management of pelvic fracture urethral distraction defects : *Indian Journal of Urology*. 2011 ; 27 (3) : 385-391.
6. Koraitim MM. Predictors of Surgical Approach to Repair Pelvic Fracture Urethral Distraction Defects. *The Journal Of Urology.* 2009 ; 182 : 1435-1439.
7. Zinman LM. The Management of Traumatic Posterior Urethral Distraction Effects – Editorial. *The Journal of Urology*. 1997 ; 157 : 511-512
8. Endrich DE, Mundy AR. The Nature of Urethtal Injury in Cases of Pelvic Fracture Urethral Trauma. The *Journal of Urology*. 2001 ; 165 : 1492 – 1495.
9. Kommu SS, Illahi I, Mumtaz F. Pattern of Urethtal Injury and Immediate Management. *Curr Opin Urol*. 2007 ; 17 : 383 – 389.
10. Sandler CM. Harris JH, Corriere JN, Toombs BD. Posterior Urethral Injuries after Pelvic Fracture. *AJR*. 1961 ; 137: 1233-1237.