Early Realignment Versus Delayed Urethroplasty in Management of Pelvic Fracture Urethral Injury: A Meta-analysis

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ABSTRAK

Tujuan: *evaluasi kejadian striktur uretra sebagai parameter keberhasilan penatalaksanaan PFUI melalui tindakan early realignment (ER), dibandingkan dengan tindakan delayed urethroplasty (DU). Komplikasi jangka panjang berupa disfungsi ereksi dan inkontinensia dari kedua tindakan tersebut juga akan dievaluasi.* ***Metode:*** *penelusuran literatur online bersumber dari Pubmed, Embase, Cochrane, dan Google Scholar. Insiden striktur dievaluasi dari seluruh studi pada kelompok ER dan DU. Striktur uretra ditegakkan dari gejala penyakit berupa keluhan obstruksi yang dirasakan pasien, pemeriksaan uretroskopi, uroflowmetri, dan residu urin post berkemih yang ditunjang dengan pemeriksaan uretrografi yang dilakukan secara berkala. Pasien dinilai tidak terjadi striktur bila tidak diperlukannnya lagi tindakan dilatasi uretra atau uretrotomi lanjutan. Penilaian inkontinensia didapatkan dari keluhan subjektif pasien. Fungsi ereksi dinilai secara subjektif, menurunnya derajat tumesen, berkurangnya durasi ereksi, kegagalan penetrasi dinilai sebagai kejadian disfungsi ereksi. Data yang didapat diolah sebagai data dikotomi dengan menghitung risk ratio dengan menggunakan Review Manager 5.1.* ***Hasil:*** *lima studi telaah dimasukkan dalam meta-analisis. Angka kejadian striktur uretra secara statistik lebih rendah bermakna pada kelompok tindakan early realignment (RR=0,70, 95% CI 0,50-0,99, p<0,05). Tidak terdapat perbedaan yang bermakna secara statistik di antara kedua kelompok tindakan terhadap angka kejadian disfungsi ereksi (RR=0,72, 95% CI 0,39-1,34) ataupun angka kejadian inkontinensia (RR=0,74, 95% CI 0,36-1,51).* ***Kesimpulan:*** *early realignment menurunkan angka terjadinya striktur pada penanganan PFUI dibandingkan dengan metode delayed urethroplasty. Untuk komplikasi yaitu disfungsi ereksi dan inkontinensia tidak ada perbedaan yang bermakna pada kedua metode.*

Kata kunci: *cedera uretra, fraktur pelvis, early realignment, delayed urethroplasty.*

ABSTRACT

Aim: *this meta-analysis study will evaluate the incidence of urethral stricture as a successfull parameter in the management of PFUI through early realignment, compared with delayed urethroplasty. Long-term complications such as erectile dysfunction and incontinence on both methods will also be evaluated.* ***Methods:*** *online literature was sourced from Pubmed, Embase, Cochrane, and Google Scholar. The incidence of stricture was evaluated from the entire study group of ER and DU. Stricture of the urethra is diagnosed by the symptoms such as the obstruction that felt by the patient, uroflowmetry examination, and urine residual post micturition that supported by urethrography examination at regular interval. In some cases the incidence of stricture also diagnosed by urethroscopy. The patient is assessed as not having stricture when it is no longer needed to do*

urethral dilatation or advanced urethrotomy. The rate of incontinence was assessed subjectively from the patient's complaints. The erectile function assessed subjectively; decreased of tumesen's degree, reduced the duration of erection, and penetration failure diagnosed as erection dysfunction. The data were processed as dichotomy data to calculate the risk ratio using Review Manager 5.1. ***Results:*** *five relevant literatures reviewed in this study. The incidence of urethral strictures are statistically significant lower in early realignment group (RR=0.70, 95% CI 0.50-0.99, P<0.05). There were no statistically significant differences between both treatment groups on the incidence of erectile dysfunction (RR=0.72, 95% CI 0.39-1.34) nor the incidence of incontinence (RR=0.74, 95% CI 0.36-1.51).* ***Conclusion:*** *early realignment decrease the occurrence of stricture on PFUI treatment compared to delayed urethroplasty method. Between the two methos, the complications such as erectile dysfunction and incontinence; however, there was no significant difference.*

Keywords: *urethra injury, pelvic fracture, early realignment, delayed urethroplasty.*

INTRODUCTION

Pelvic Fracture Urethral Injury (PFUI) is a disorder in urology often found in pelvic trauma, with an incidence ranging from1.6% to 25%.[1] The disorder is often caused by high-velocity injury associated with pelvic ring disruption.[2] The pelvic fractures indicate a considerable strength in the lower abdominal area/pelvis. This energy can be transferred to the internal organs in the pelvic cavity including the lower urinary tract. Physical compression occurs and the prostate is forced into the perineal membrane, causing stretching of the urethra, and can be followed by rupture of the posterior urethra.[3] PFUI can lead to complications such as urethral stricture, urinary incontinence, and erectile dysfunction; which causes long-term impairment for the patient.[4]

PFUI management until todays is still matter of controversy. In the beginning, the early realignment (ER) in the form of primary suturing/ open urethra realignment is the best management for PFUI. In correlation with the limited mobilization of patients in pelvic fractures and the high incidence of complications caused delayed urethroplasty (DU) with cystostomy diversion be preferred. Advancement in endoscopic techniques lead to early realignment through endoscopic (Primary Endoscopic Realignment-PER) became an alternative management with good results.

This meta-analysis study will evaluate the incidence of urethral stricture as a success parameter management of PFUI through early realignment, compared with delayed urethroplasty. Long-term complications such as erectile dysfunction and incontinence on both methods will also be evaluated. All articles included in this study involve a retrospective cohort studies.

METHODS

Eligibility Criteria

All articles included in this study were published in international journals with English language within the last fifteen years. Only studies with management of PFUI through early realignment, compared with delayed urethroplasty were included. Furthermore, the outcome measures in this study were the long-term complications such as urethral stricture, erectile dysfunction and incontinence.

Information Sources

Online literatures sourced from Pubmed, Embase, Cochrane, and Google Scholar. Keywords used mesh words "pelvic fracture urethral injury" OR "PFUI" AND "management" OR "early realignment" OR "delayed urethroplasty". The last literature search was on October 2015.

Search

The search terms of the study used the PICOS formula. Related articles of relevant literatures were also searched thoroughly.

Study Selection

Inclusion criteria of the study use the PICOS formula as presented in **Table 1**.

Exclusion criteria are non-English studies, studies with non-PFUI patients, and studies

Table 1. PICOS: study criteria

Patients	Patients with Pelvic Fracture Urethral Injury
Interventions	Realignment
Comparisons	Early Realignment versus Delayed Urethroplasty
Outcome	Urethral stricture, erectile dysfunction, incontinence
Study design	Retrospective Cohort Study

that classified as 'review article', 'systematic review', 'meta-analysis', and 'case report' which does not compare early realignment and delayed urethroplasty. Furthermore, the inclusion and exclusion of this Meta-analysis study illustrated schematically using PRISMA flow diagram as shown in **Figure 1**.

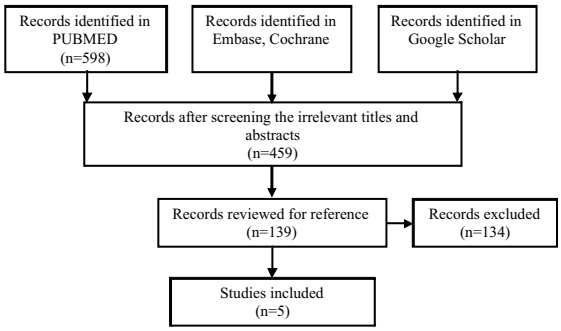


Figure 1. Schematic flow search

Data Collection Process

The data of the study were processed after reviewing the full manuscripts.

Statistical Analysis

The data of the study were processed as dichotomy data. To calculate the dichotomy data, this study are using the risk ratio (RR) and test I2 for assessed the heterogeneity (low (25%-50%), moderate (50%-75%) and high (>75%)). In this study, statistical analysis was performed using Review Manager 5.1.

RESULTS

Study Selection

During literature searches, the authors have identified 598 relevant literatures. After screening through the titles and abstracts of the 598 literatures, 459 literatures were excluded. Subsequently, 139 literatures are reviewed as a reference, to identify the literatures that fulfil the inclusion criteria of the study. However, after reviewing the full manuscript, the authors found 134 literatures classified as exclusion criteria. Therefore, the final results of literature searches identified five relevant literatures will be reviewed in this study (**Figure 1**).

Participants and Intervention

Based on the five relevant literatures, the numbers of samples obtained are 393 patients with PFUI. Total patients with pelvic fracture urethral injury (PFUI) that had a good handling of early realignment (ER) are 177 patients and 216 patients treated with delayed urethroplasty (DU).

Comparison

All of the five relevant literatures are showed the incidence of urethral stricture between patients treated with early realignment (ER) and delayed urethroplasty (DU) (**Figure 2**). However, only three studies compared the incidence of erectile dysfunction (**Figure 3**) and incidence of urinary incontinence in patient with early realignment (ER) and delayed urethroplasty (DU) (**Figure 4**).

Outcome

Stricture of the urethra is diagnosed by symptoms such as obstruction that felt by the patient, uroflowmetry examination, and urine residual post micturition that supported by urethrography examination which is done regularly. In some cases the incidence of stricture is also diagnosed by urethroscopy. The patient is assessed as not having stricture when is no longer needed urethral dilatation or advanced urethrotomy. The rate of incontinence assessed subjectively from the patient's complaints. The erectile function assessed subjectively; decreased of tumesen's degree, reduced the duration of erection, and penetration failure diagnosed as erection dysfunction.[1-6]

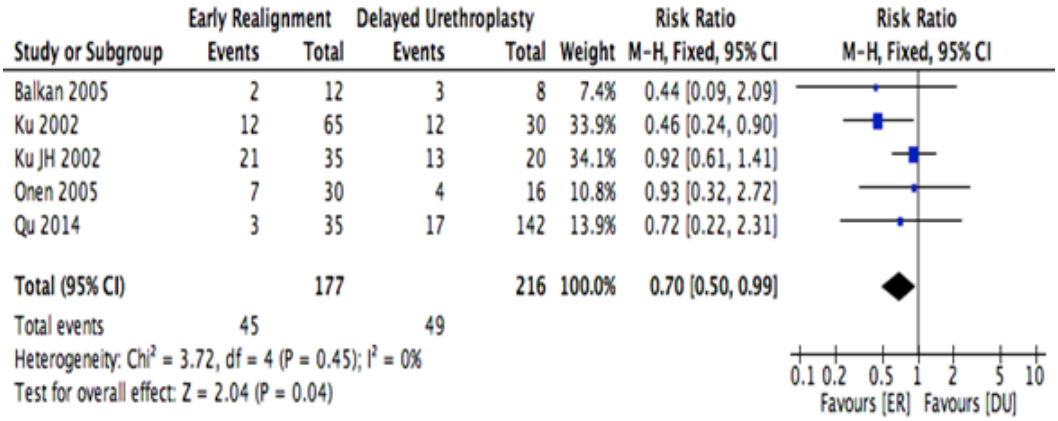
Realignment openly conducted in a way to insert a retrograde catheter through the external meatus to identify the urethra rupture in distal section. Other catheter inserted into the proximal urethra through the bladder to identify the

proximal end of the rupture. The ends of both catheters are connected to create realignment.[7-11] In these studies, early realignment is done in the first 14 days after the incident of PFUI. For partial urethral injury, folley catheter insertion is slowly performed in one time trial.[8-10] Endoscopic realignment (Primary Endoscopic Realignment-PER) was also performed in two studies.[9,10] Urethral catheter on hold for 3-8 weeks, until the result of urethrogram peri-catheter showing the normal conditions of urethra marked by the absence of extravasation of contrast.[7-11]

In the group of delayed urethroplasty, cystostomy performed followed by definitive treatment 3-6 months after PFUI. Post-treatment, the catheter was hold for 2-4 weeks, until the result of urethrogram peri-catheter showed healing.

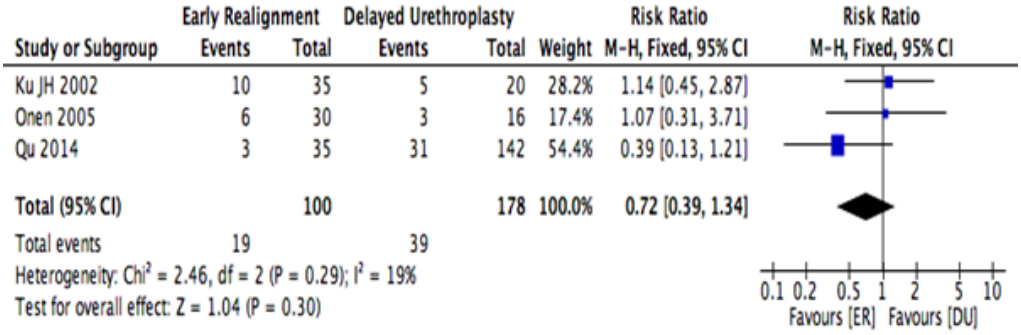
The incidence of urethral strictures are statistically significant lower in early realignment group (RR=0.70, 95% CI 0.50-0.99, P<0.05). Test I2 for heterogeneity was applied to the studies reviewed in the incidence of urethral stricture and get 0%. Forest plots formed of five research studies in the meta-analysis. Forest plot looks symmetrical collected, which shows a lack of bias publications.

The incidence of erectile dysfunction after treatment is assessed from three studies (**Figure 3**). There were no statistically significant differences between both treatment groups on the incidence of erectile dysfunction (RR=0.72, 95% CI 0.39-1.34).



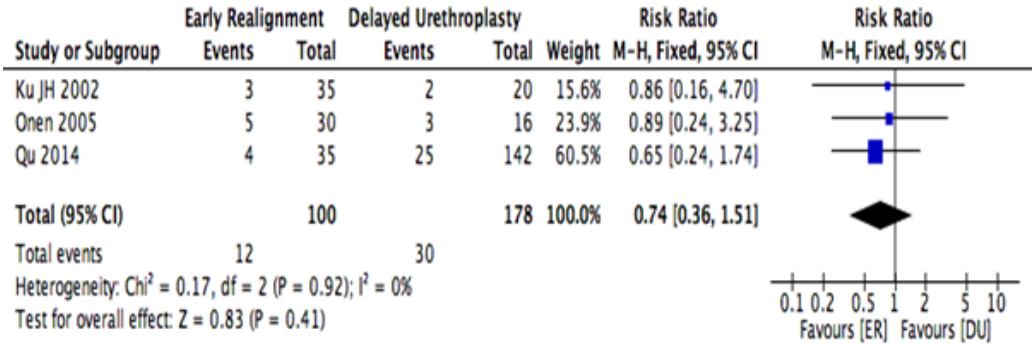
CI=confidence interval; ER=early realignment; DU=delayed urethroplasty

Figure 2. Meta-analysis of the incidence of urethral stricture



CI=confidence interval; ER=early realignment; DU=delayed urethroplasty

Figure 3. Meta-analysis of the incidence of erectile dysfunction



CI=confidence interval; ER=early realignment; DU=delayed urethroplasty

Figure 4. Meta-analysis of the incidence of urinary incontinence

The incidence of incontinence after treatment assessed from three studies (**Figure 4**). There were no statistically significant differences between both treatment groups on the incidence of incontinence (RR = 0.74, 95% CI 0.36-1.51).

DISCUSSION

Urethral injury is commonly caused by blunt trauma to the pelvis in men. Besides causing urethral strictures, the injury can cause long-term complications, such as incontinence and erectile dysfunction, which can certainly be an emotional stressor for the patient. Management of PFUI until today is still a matter of controversy; between early realignment and delayed repair.[12,13] The aim of PFUI management is not to prevent stricture but to ensure that the strictures that occur can be handled easily.[9]

Early realignment was first introduced by Ormond and Cothran in 1934. The purpose of the early realignment is to pull down the proximal urethra properly/parallel to the distal side so that healing process will occur with minimal strictures.[5] Treatment with early realignment can be done when the patient's condition is stable and life-threatening injuries have been treated.[6] In patients with vascular injury or other abnormalities that require exploration in the pelvic cavity, prostatourethral severe dislocation, or laceration of the neck of the bladder; early realignment could minimizes the problems that will occur next.[9]

Early realignment method in recent decades becomes easier with advances in urology endoscopy technique.[5] The benefits of endoscopy are less bleeding, reduced period of hospitalization, and reduce the possibility of stricture.[12] Other studies show that early realignment using endoscopic techniques may reduce the frequency of advanced urethrotomy procedures which provides a great advantage in the management of the complications and costs.[14]

There are several endoscope methods of choice for PFUI management with good results. Some studies support the use of flexible cystoscopy after failing catheter insertion. Cystoscopy, either rigid or flexible, can be performed simultaneously through cystostomy and through the urethra; to facilitate the process of realignment.[15] The success rate of realignment using endoscopy is very good, which is 72-100%.[5,16-18] The success rate will be increased in accordance with the increasing number of the operator's experience.[19,20]

Cystostomy - delayed urethroplasty introduced by Johansson in Sweden in 1953. In this method, the only emergency action that has done is urinary diversion through the installation of cystostomy, without exploration of urethral injury. The stricture cannot be avoided and will be treated electively several months later.[7] The benefits of delayed repair is that urinary diversion is easily done, optimizing the patient's general condition; and management of other injuries that are more life-threatening. Exploration of the urethra in the acute phase of injury is difficult and high risk of failure, and lost a lot of blood, thus delayed repair is an option.[7,9]

Delayed urethral repair is indicated when the rupture is not complete, the separation of the urethra is minimal, critical condition of unstable patients, and there is no facility that support or in the absence of an experienced surgeon.[21] The disadvantage of this method is the need to wear a suprapubic tube for a long time, which would cause discomfort to the patient.[12]

When comparing the success of these two methods, the degree of incontinence and erectile dysfunction were also compared. In this meta-analysis, the incidence of urinary incontinence and erectile dysfunction between the two treatment groups showed a similar relative. This shows that both incidences are caused by the initial injury, not a complication after-treatment.

Erectile dysfunction of PFUI can be caused by vasculogenic factors and neurogenic factors. Stief et al explain that impotence occurs after pelvic trauma is due to the damage of the autonomic plexus and erigentes nerve as a result of the displacement of the prostate.[22] Armenakas et al.[23] evaluated the impotent patient with disruption of the prostate pars membranous before done the reconstruction using MRI pelvis and ultrasound duplex; and it shows that 80% cases of erectile dysfunction is caused by vasculogenic.Erectile dysfunction caused by abnormal blood vessels can be treated by penile revascularization.[24] Husmann et al reported that there was no significant difference in the degree of incontinence in patients treated with early realignment and delayed urethroplasty.[12] In the final analysis the results are dependent on the type of the injury and the quality improvements are made.

Studies included in this study are retrospective. Despite the retrospective study's relatively low evidence, the authors chose to include the studies because it is good to get the information needed as well as a foundation for further research. Another weakness of this study is a limitation of the authors in finding studies that were not published.

CONCLUSION

Early realignment decreases the occurrence of stricture on PFUI treatment, compared to the delayed urethroplasty method. Furthermore, about the complications such as erectile dysfunction and incontinence; there was no significant difference in these two methods. Hence, the advances in endoscopic urology technique will increase the success of the early realignment method and reduce the cost.

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