Predicting Risk of Erectile Dysfunction after Pelvic Fracture Urethral Injury in Children

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Purpose: We sought to determine the incidence of erectile dysfunction following pelvic fracture urethral injuries in children, and to identify the related causes and risk factors.

Materials and Methods: All consecutive children who had undergone repair of a pelvic fracture urethral injury between 1980 and 2010 were invited to participate in the study. All responders were queried after a median of 13 years (range 3 to 28) following trauma to assess erectile function using the erectile function domain of the International Index of Erectile Function. Patients who had erectile dysfunction underwent penile duplex ultrasonography. Medical records and imaging studies were reviewed with a focus on 4 variables, ie pattern of pelvic fracture, pubic diastasis, prostatic displacement and urethral gap length. Univariate and multivariate analyses were used to identify parameters predictive of erectile dysfunction at puberty.

Results: A total of 60 patients participated in the study, of whom 28 (47%) had erectile dysfunction. On univariate analysis all 4 parameters were significant predictors of erectile dysfunction, while on multivariate analysis only 2 parameters remained strong and independent predictors, namely urethral gap length 2.5 cm or greater and prostatic displacement in a lateral direction. Duplex ultrasound revealed the cause of erectile dysfunction as arteriogenic in 19 patients (76%), arteriovenogenic in 2 (8%) and likely neurogenic in 4 (16%).

Conclusions: For every 2 children sustaining a pelvic fracture urethral injury 1 will exhibit erectile dysfunction at puberty. The risk of erectile dysfunction is appreciably increased in the presence of a long urethral gap and/or lateral prostatic displacement. The cause of erectile dysfunction is most commonly primarily arteriogenic and less commonly neurogenic.

Key Words: child; erectile dysfunction; fractures, bone; pelvis; urethra

ERECTILE dysfunction is a commonly reported complication after pelvic fracture urethral injury, with an incidence of 19% to 72% (mean 45%).[1–4] However, almost all published studies have been concerned with adult and postpubertal patients at the time of injury. In fact, we were able to find only 2 reports in the English literature, dating 21 and 27 years ago, dealing with sexual potency in patients injured prepubertally and followed to puberty.[5,6] Since 1975, we have been performing urethroplasty for patients with pelvic fracture urethral injury, of whom an appreciable proportion are children. Some of these children present to us after reaching adulthood and before getting married to solve the problem

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of erectile dysfunction. Thus, we decided to study the incidence of erectile dysfunction in these patients to identify the causes and related risk factors.

PATIENTS AND METHODS

All consecutive patients who had undergone delayed repair of PFUI from 1980 to 2010 were identified from our database. Inclusion criteria consisted of age less than 15 years at initial injury and 18 years or older at assessment. Exclusion criteria consisted of incomplete clinical data or inconclusive imaging studies. Patients were invited by mail to participate in the study. Responding patients were asked to answer a brief questionnaire consisting of 6 questions that were designed to assess erectile experience within the last 4 weeks. This questionnaire is the EF domain of the International Index of Erectile Function, as described by Rosen et al.[7] Based on the total score of 30 for the EF domain, the score was calculated for every patient. ED was graded based on 4 categories, ie no dysfunction (score 26 to 30) and mild (17 to 25), moderate (11 to 16) and severe dysfunction (6 to 10). All responders were queried after a median of 13 years (range 3 to 28) after pelvic trauma.

Patients who had ED were scheduled for penile color duplex ultrasonography with intracavernous injection of a triple drug mixture of 10 μg alprostadil, 10 mg papaverine and 0.3 mg phentolamine. A vasoactive drug induced peak systolic velocity exceeding 25 cm per second distinguishes normal from insufficient penile arterial inflow, and end diastolic velocity less than 4.5 cm per second indicates normal venoocclusive function.[8] Patients with normal arterial parameters were diagnosed with probable neurogenic ED. Also the characteristics and degree of the erection were evaluated during the test.

Medical records and imaging studies of all participating patients were reviewed, with a focus on 4 variables that may influence the development of ED. These variables included pattern of pelvic fracture, presence of pubic diastasis, displacement of the prostate (superior vs superolateral displacement) and length of bulboprostatic urethral gap. Pelvic fractures were categorized into single ramus fracture, ipsilateral ischiopubic rami fracture, bilateral 2 or more rami fracture including straddle fracture (fracture of all 4 ischiopubic rami), and fracture of both ischiopubic rami with disruption of ipsilateral sacrum or sacroiliac joint (Malgaigne fracture). The length of urethral gap and type of prostatic displacement were determined by MRI and/or up-and-down urethrography, and the findings were confirmed during surgery.

Presented data are expressed as median, range and percentage when applicable. Univariate analysis with the chi-square and Student t-tests was used to assess the value of the 4 variables in predicting the development of ED. The significant factors were subsequently entered into multivariate analysis using a forward likelihood multiple logistic regression model to identify independent predictors. All tests were 2-sided, with significance considered at p <0.05. All data were analyzed using SPSS®, version 17.

RESULTS

Given the length of followup after initial injury and surgical repair, we could not locate 44 of 104 patients (42%) due to changes in contact information. Overall 60 patients participated in the study. Median patient age was 12 years (range 3 to less than 15) at trauma and 23 years (18 to 38) at assessment of EF. Of the 60 patients 28 (47%) exhibited ED at puberty, with 23 (82%) reporting severe and 5 (18%) mild ED.

Of the patients 24 had initially been treated with primary realignment at open surgery and 36 with placement of a suprapubic tube with planned delayed repair. Of these patients 16 (67%) and 12 (33%), respectively, exhibited ED. The influence of the 4 variables on the development of ED at puberty is summarized in the table. The majority of patients with superolateral prostatic displacement demonstrated ED, compared to a small percentage of those with the prostate displaced only in a superior direction. Median length of urethral gap in patients with normal EF was approximately half that of patients with ED. Finally, all children with a urethral gap smaller than 2.5 cm had normal EF at puberty, while all children having a urethral gap of 2.5 cm or longer exhibited ED.

On univariate analysis all 4 variables were significant factors for prediction of the development of ED at puberty (see table). However, on multivariate analysis only 2 factors remained strong and independent predictors, ie urethral gap length and lateral displacement of the prostate. When the model with the 2 factors combined was used for prediction, the accuracy was 100%.

Of 28 sexually impotent patients 25 underwent penile duplex ultrasonography, which showed normal homogeneous echotexture of both corpora cavernosa with no areas of fibrosis in all instances. Following triple drug mixture injection, there was mild tumescence of the penis in 21 cases (84%), moderate rigidity in 3 (12%) and fair 80-degree erection in 1 (4%). In

Univariate analysis of potential predictive factors of ED after PFUI in 60 children

	EF		ED		p Value*
No. pelvic fracture (%):					<0.001
Single ramus	12	(75)	4	(25)	
Ipsilat rami	20	(71)	8	(29)	
2 or More bilat rami	0	(0)	8	(100)	
Malgaigne	0	(0)	8	(100)	
No. pubic symphysis (%):					0.008
Diastasis	4	(25)	12	(75)	
Intact	28	(64)	16	(36)	
No. prostatic displacement (%):					<0.001
Superior	28	(87)	4	(13)	
Superolat	4	(14)	24	(86)	
Median cm urethral gap (range)	1.7 (1—2.5)		3.0 (2.5—5)		<0.001

* Chi-square or t-test.