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Do adult men with untreated ventral penile curvature have adverse outcomes?

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Summary

Introduction—Congenital ventral penile curvature without hypospadias is often treated surgically in childhood. The history of untreated ventral curvature is unknown.

Objective—This study's aim was to examine the association of untreated ventral penile curvature with various sexual and psychosexual outcomes.

Study design—An electronic survey was advertised to men older than 18 years on Facebook. Men with possible ventral penile curvature identified themselves by choosing sketches that most closely represented their anatomy. Outcomes assessed included: Sexual Health Inventory for Men, difficulty of intercourse because of curvature, International Prostate Symptom Score, Penile Perception Score, psychosexual milestones, paternity, infertility, sitting to urinate, and the CDC HRQOL-4 module.

Results—Among participants, 81 out of 684 men (11.8%) reported untreated ventral penile curvature. Participants with self-reported curvature noted more difficulty with intercourse because of curvature (4.5 vs 4.9, $p < 0.001$), more unhealthy mental days (8.6 vs 6.2, $p = 0.02$), and increased dissatisfaction with penile self-perception compared with men without reported curvature (8.6 vs 9.5, $p < 0.001$).

Discussion—Men with possible untreated ventral curvature reported worse penile perception scores, more mentally unhealthy days, and increased difficulty with intercourse secondary to curvature compared with men without curvature. A limitation to this study is selection bias; responses collected were self-reported from survey volunteers. Additionally, the question identifying ventral penile curvature is not validated but performed well in pretesting. Most questions were from validated surveys, but some were modeled after validated surveys and/or contained high face validity types of questions.

Conclusion—Men with possible untreated ventral penile curvature reported more dissatisfaction with penile appearance, increased difficulty with intercourse, and more unhealthy mental days. Given high success rates, low complications, and improved outcomes after surgical

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Conflict of interest

None.

correction of penile curvature reported in the literature, our results support correction of congenital penile curvature in childhood.

Keywords

Untreated ventral curvature; Chordee; Sexual Health Inventory; Penile perception score; CDC Healthy Days Core Module; International Prostate Symptom Score

Introduction

Congenital ventral penile curvature or chordee is a congenital anomaly that occurs in approximately 1 in 167 male births [1]. Ventral penile curvature is also usually found in children with hypospadias, which is defined as an abnormal proximal location of the urethral meatus on the ventral penis. Although ventral penile curvature may not affect a child in terms of increased risk of urinary tract infection or urinary pattern, it is possible that untreated ventral curvature may affect outcomes as an adult such as sexual health, urinary symptoms, and quality of life. Therefore, in children with isolated ventral penile curvature, this is often surgically corrected in childhood. In addition, in children with mild forms of hypospadias such as glandular hypospadias, some advocate correction of the ventral penile curvature without urethroplasty as the ventral penile curvature is thought more likely to cause clinical issues than the glandular hypospadias [2].

The natural history of untreated ventral penile curvature is not well known, and there is limited information regarding what degree of ventral penile curvature is clinically significant and should be surgically corrected [3]. Prior work by Schlomer et al. utilized a social media advertised survey to study the natural history of adult men with untreated hypospadias [4]. Validated questionnaires were used when available and outcomes studied in this survey included sexual health, urinary symptoms, penile self-perception, psychosexual milestones, paternity and infertility, need to sit to urinate, ventral penile curvature and difficulty with intercourse from curvature, and quality of life. This study revealed that men with self-reported untreated hypospadias fared worse than men without hypospadias in their sexual health scores, urinary symptoms, and difficulty with intercourse secondary to curvature. Subset analysis showed that such differences were more pronounced with severe hypospadias. Utilizing data from the above mentioned study, we seek to compare the outcomes in men who identified themselves as having ventral penile curvature without hypospadias to men who did not report ventral penile curvature. We hypothesized that adult men who reported untreated ventral penile curvature would have worse outcomes than those men who did not report ventral penile curvature.

Methods

Survey

Following institutional review board approval, study data were collected over a 4-month period (October 2012–January 2013) and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at University of California San Francisco and described previously [4,5]. The predictor was whether or not a participant self-identified

as having possible untreated ventral penile curvature and the severity of curvature based on answers to self-reported anatomy questions supplemented with penile sketches (Fig. 1). Outcomes included the Penile Perception Score (PPS) [6], the Sexual Health Inventory for Men (SHIM) score [7–9], the International Prostate Symptom Score (IPSS) [10,11], CDC Healthy Days Core Module (CDC HRQOL-4) (CDC), paternity status, history of infertility diagnosis or treatment, frequency of sitting to urinate modeled after IPSS questions, penile curvature based on sketches of curvature (Fig. 1), reported degree of difficulty with intercourse from penile curvature modeled after SHIM questions, and sexual milestones attained and age when attained. The entire survey has been published previously [4].

Pretesting

As a proxy measure for criterion validity for the self-reported penile curvature question, the question was pretested on 26 subjects without hypospadias or penile curvature that included 22 male and four females. The pretest subjects took an online survey that showed a series of penis images with varying anatomy from normal to severe ventral curvature. The subjects were asked to pick the sketch that best depicted the anatomy in question in the picture. Pretest subjects' answers to five penile curvature questions had 100% sensitivity and between 96% and 100% specificity in detecting ventral penile curvature. In addition, pretest subjects selected the same curvature as consensus opinion of two pediatric urologists 83% of the time and were within one choice up or down 100% of the time.

Identification of untreated ventral penile curvature

Participants were considered to have possible untreated ventral penile curvature if they chose a penile appearance that corresponded to ventral curvature (3, 4, or 5 in Fig. 1). Ventral penile curvature was categorized as mild if answer 3 was chosen and severe if answers 4 or 5 were chosen. Mild ventral penile curvature in our study, as depicted by image 3 in Fig. 1, was measured to be around 20° of ventral curvature, whereas images 4 and 5 were measured at around 45° and 90° of ventral curvature, respectively. Men were excluded who self-identified with hypospadias from answers to other questions.

Statistical analysis

Outcomes in participants with possible untreated ventral penile curvature were compared with those of men with no reported ventral curvature. All participants with possible untreated ventral curvature were compared with no ventral curvature and then participants were compared with no ventral curvature by severity as defined above. Continuous outcomes were compared by using student's *t*-test, ordinal outcomes were compared by Wilcoxon rank sum test, and dichotomous variables by chi-square test or Fisher's Exact test. Stata 12 (College Station, TX, USA) was used for all analysis and α of 0.05 chosen for significance.

Results

Participants

Of the men who started the survey ($n = 1075$), 736 completed questions regarding self-anatomy (Table 1). Of those 736 participants, 52 were excluded because they self-identified as possibly having hypospadias. Of the remaining 684 participants, 81 (11.8%) reported

ventral penile curvature. There were no statistically significant differences in patient characteristics between the participants with and without ventral curvature (Table 1).

Association of possible ventral penile curvature with outcomes

The associations of all men with possible untreated ventral penile curvature and outcomes are reported in Table 2. As a group, all men with possible untreated curvature reported more difficulty with intercourse secondary to curvature ($p < 0.001$) and more unhealthy mental days ($p = 0.02$). They also reported more dissatisfaction with penile self-perception, especially with penile curvature ($p < 0.001$). Other measures were not significantly different between groups.

Association of mild and severe ventral penile curvature with outcomes

Participants with possible untreated ventral curvature were stratified into mild ($n = 68$) and severe ($n = 13$) groups and each group compared with normal (Table 3). Those with mild curvature reported more difficulty with intercourse ($p < 0.001$) and more unhealthy mental days ($p = 0.046$) compared with the normal group. For participants with severe curvature, they reported even more difficulty with intercourse secondary to curvature ($p < 0.001$), more unhealthy mental days ($p = 0.18$), and exhibited the following trends: less likely to have had intercourse (69% vs 89%, $p = 0.053$), less likely to have kissed anyone (77% vs 96%, $p = 0.02$), and trended towards worse SHIM scores ($p = 0.07$) when compared with participants with no self-reported curvature. Participants with both mild and severe ventral curvature reported more dissatisfaction with penile self-perception most pronounced with penile curvature ($p < 0.001$).

Discussion

We examined whether men with self-reported untreated ventral penile curvature have similar outcomes to men without ventral penile curvature. Men with possible untreated ventral penile curvature reported more dissatisfaction with penile self-perception including penile axis/curvature, more difficultly with intercourse because of penile curvature, and more unhealthy mental days. Men with more severe ventral penile curvature also trended towards having worse SHIM scores as well as being less likely to report ever having sexual intercourse. These results suggest that untreated ventral penile curvature as low as 20° may lead to sexual bother from difficulty with intercourse and potentially worse SHIM scores with more severe ventral curvature.

There are limited studies on the natural history of untreated ventral penile curvature, and there is no consensus as to what constitutes clinically significant curvature. A survey of practice patterns in the approach to children with penile curvature and hypospadias was conducted among members of the American Academy of Pediatrics and 75% of responders reported they would correct ventral penile curvature greater than 20° [12].

Success rates for correction of ventral penile curvature in the literature as defined by penile straightening have been reported at greater than 90% in both children and adults [13–15], and complication rates are reported to be low [14,16]. Polat and colleagues reported 94% success for straightening of ventral curvature without hypospadias in both children and

adults and only 2/22 children followed until adolescence had recurrence of curvature requiring an additional surgical procedure [16]. This rate of recurrence is comparable with the penile curvature recurrence rate of 10% when surgery is performed in adults [13].

The potential benefits of surgical correction of penile curvature have been shown in several studies. Tal et al. reported psychosexual outcomes in 32 men after correction of congenital penile curvature (20 ventral, 12 lateral), and reported improvements in several psychosexual health domains including sexual relationships, overall relationship, confidence, libido, and sexual satisfaction [17]. Several studies in the adult literature on correction of penile curvature from Peyronie's disease report improved sexual function and patient satisfaction [18–23].

This study adds to existing literature that suggests men with untreated congenital ventral penile curvature may have adverse outcomes such as dissatisfaction with penile appearance, difficulty with sexual intercourse, and adverse psychological effects. Given the high reported success rates for surgical correction of penile curvature, as well as the positive impact on sexual function and psychological well-being reported after correction of penile curvature in many studies, this suggests that treatment of congenital penile curvature in infancy or childhood will prevent adverse outcomes. Although more research is needed to determine the degree of congenital ventral curvature that will become clinically significant in the future, our study suggests that ventral curvature as little as 20° may be associated with adverse outcomes. As a randomized trial comparing surgical correction with no correction of congenital ventral penile curvature in infancy or childhood is unlikely to be performed, our results that suggest the natural history of untreated ventral penile curvature leads to adverse outcomes, coupled with other studies that show improved sexual outcomes and satisfaction after surgical repair, support the practice of surgical correction in infancy or childhood.

There are several weaknesses in this study. Although validated survey instruments were employed when possible, other novel questions such as paternity and sexual milestones were used. These questions were provided in a "yes/no" format and have high face validity. Questions regarding difficulty with sexual intercourse secondary to penile curvature and the frequency of sitting to urinate were modeled after validated surveys such as the IPSS and SHIM. Selection bias could have contributed to the observed associations if men who reported adverse outcomes were also more likely to incorrectly identify themselves as having penile ventral curvature. It is also possible that men who were unsatisfied with their penis or its function for a variety of reasons were more likely to incorrectly select that they had ventral penile curvature and also report adverse outcomes or increased numbers of unhealthy mental days. The question used for subjects to identify penile curvature anatomy was not validated, although pretesting suggested very good sensitivity and specificity. Lastly, the study was designed to test the hypothesis that men with untreated hypospadias had adverse outcomes and this study is a secondary analysis.

Conclusions

Men with self-reported untreated ventral curvature of the penis reported similar IPSS scores, paternity rates, infertility, and frequency of sitting to urinate when compared with men

without ventral curvature. However, men with possible untreated ventral curvature had more difficulty with intercourse because of penile curvature as well as decreased satisfaction with penile curvature, and more unhealthy mental days. Along with existing literature, this study supports the practice of correcting congenital ventral penile curvature in infancy or childhood to prevent these adverse outcomes. More studies are needed to demonstrate improved outcomes with surgical correction of congenital ventral penile curvature in childhood and to determine the degree of penile curvature that is clinically significant.

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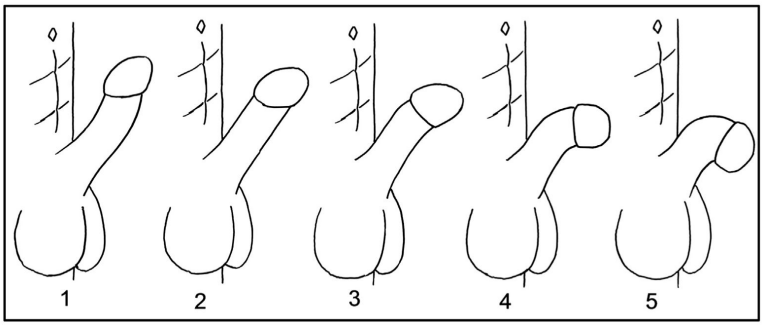

Figure 1.

Sketches used for participants to report anatomy. Participants were asked to following question. Which of the above sketches is most like the curvature of your penis when you have an erection (penis gets hard)? We are only asking about up/down curvature not left/right curvature. Choose the best answer (1–5).

Table

Association of outcomes with possible untreated ventral curvature.

	No ventral curvature (*N* = 598)	Self-reported ventral curvature (*N* = 81)	*p*-Value[a]
Penile perception overall score	9.5 (2.0)	8.6 (2.3)	<0.001
CDC HRQOL-4	6.2 (9.3)	8.6 (10.6)	0.02
Mean number of mentally unhealthy days			
Penile curvature[b]	1.6 (0.5)	3.2 (0.6)	<0.001
Difficulty of intercourse secondary to penile curvature[c]	4.9 (0.6)	4.5 (0.7)	<0.001

Data presented as mean (standard deviation).

[a] Continuous outcomes compared by Student's *t* test, ordinal by Wilcoxon rank sum test, dichotomous by chi-square or Fisher's Exact test.

[b] Higher number corresponds to more ventral curvature.

[c] 1 = did not attempt intercourse; 2 = extremely difficult; 3 = very difficult; 4 = difficult; 5 = slightly difficult; 6 = not difficult.

Table 1

Patient characteristics.

	All (*N* = 684)	No ventral curvature (*N* = 598)	Ventral curvature (*N* = 81)	*p*-Value[a]
Race				
White (Caucasian)	580 (84.8%)	508 (84.3%)	72 (88.9%)	0.7
Black	22 (3.2%)	20 (3.3%)	2 (2.5%)	
Asian	14 (2.1%)	11 (1.8%)	3 (3.7%)	
Pacific Islander	3 (0.4%)	3 (0.5%)	0	
Native American	3 (0.4%)	3 (0.5%)	0	
Hispanic or Latino	30 (4.4%)	27 (4.5%)	3 (3.7%)	
Other	17 (2.5%)	16 (2.7%)	1 (1.2%)	
No answer	15 (2.2%)	15 (2.5%)	0	
Sexual orientation				0.5
Homosexual	167 (24.4%)	149 (24.7%)	18 (22.2%)	
Bisexual	65 (9.5%)	58 (9.6%)	7 (8.6%)	
Heterosexual	416 (60.8%)	366 (60.7%)	50 (61.7%)	
Asexual	12 (1.8%)	9 (1.5%)	3 (3.7%)	
Queer	16 (2.3%)	13 (2.2%)	3 (3.7%)	
No answer	(1.2%)	8 (1.3%)	0	
Age in years (SD)	43.0 (39.9)	43.2 (41.8)	42.0 (20.4)	0.8
Circumcised	537/669 (80.3%)	476/589 (80.8%)	61/80 (76.3%)	0.3
Born in USA	617/679 (90.9%)	544/598 (91.0%)	73/81 (91.2%)	0.8
Born in hospital	622/666 (93.4%)	549/587 (93.5%)	73/79 (92.4%)	0.7

[a] Dichotomous and categorical variables compared by chi-square test, continuous variables compared by Student's *t* test.

Table 2

Association of outcomes with possible untreated ventral curvature.

	No ventral curvature (*N* = 598)	Possible ventral curvature (*N* = 81)	*p*-Value[a]
PPS[b]			
Length of penis	1.9 (0.7)	1.9 (0.8)	0.9
Position and shape of urethral opening	2.4 (0.6)	2.3 (0.6)	0.1
Shape of glans	2.5 (0.5)	2.2 (0.6)	0.001
Shape of penile skin	2.3 (0.6)	2.1 (0.7)	0.005
Penile axis (curvature)	2.4 (0.7)	1.7 (0.8)	<0.001
General appearance	2.2 (0.7)	1.9 (0.8)	0.002
Overall PPS	9.5 (2.0)	8.6 (2.3)	<0.001
SHIM score	20.7 (5.8)	20.8 (4.5)	0.9
IPSS score	5.8 (5.9)	6.9 (7.2)	0.1
CDC HRQOL-4			
Would you say your general health is[c]	2.5 (1.0)	2.7 (1.0)	0.08
Mean number of physically unhealthy days	3.5 (6.8)	3.7 (8.3)	0.7
Mean number of mentally unhealthy days	6.2 (9.3)	8.6 (10.6)	0.022
Caused a pregnancy	278/594 (46.8%)	39/80 (48.8%)	0.4
Diagnosis of infertility	19/596 (3.2%)	3/81 (3.7%)	0.5
How often to you sit on toilet to just urinate?[d]	1.9 (1.2)	1.7 (1.1)	0.8
Penile curvature[e]	1.6 (0.5)	3.2 (0.6)	<0.001
How difficult did the curvature of your penis make intercourse?[f]	4.9 (0.6)	4.5 (0.7)	<0.001
Have you ever kissed anyone?	571/595 (96.0%)	76/81 (93.8%)	0.3
Age in years	14.2 (4.5)	13.5 (4.8)	0.2
Have you ever been in love?	528/593 (89.0%)	67/81 (82.7%)	0.1
Age in years	18.3 (6.0)	17.4 (6.1)	0.3
Have you ever had sexual intercourse?	530/597 (88.8%)	68/81 (84.0%)	0.2
Age in years	18.4 (5.1)	17.6 (4.2)	0.2
Have you ever masturbated?	583/597 (97.7%)	80/81 (98.8%)	0.5
Age in years	12.3 (2.7)	12.7 (2.6)	0.2

Data presented as mean (standard deviation) or proportion with “yes” answer.

[a] Continuous outcomes compared by student’s *t*-test, ordinal by Wilcoxon rank sum test, dichotomous by chi-square or Fisher Exact test.

[b] All questions coded as 3 = very satisfied; 2 = satisfied; 1 = dissatisfied; 0 = very dissatisfied.

[c] 1 = excellent; 2 = very good, 3 = good, 4 = fair, 5 = poor.

[d] 1 = Almost never or never; 2 = a few times (much less than half the time); 3 = sometimes (about half the time); 4 = most times (much more than half the time); 5 = almost always or always.

[e] Higher number corresponds to more ventral curvature. See Fig. 1.

[f] 1 = did not attempt intercourse; 2 = extremely difficult; 3 = very difficult; 4 = difficult; 5 = slightly difficult; 6 = not difficult.

Table 3

Association of outcomes with possible untreated ventral curvature by severity.

	No ventral curvature (*N* = 598)	Mild curvature (*N* = 68)	*p*-Value[a]	Severe curvature (*N* = 13)	*p*-Value[a]
PPS[b]					
Length of penis	1.9 (0.7)	1.8 (0.8)	0.5	2.2 (0.7)	0.2
Position and shape of urethral opening	2.4 (0.6)	2.3 (0.6)	0.1	2.4 (0.5)	0.8
Shape of glans	2.5 (0.5)	2.2 (0.6)	0.003	2.2 (0.6)	0.1
Shape of penile skin	2.3 (0.6)	2.1 (0.7)	0.02	2.1 (0.5)	0.07
Penile axis (curvature)	2.4 (0.7)	1.8 (0.8)	<0.001	1.3 (0.8)	<0.001
General appearance	2.2 (0.7)	1.9 (0.8)	0.003	2.0 (0.6)	0.2
Overall PPS	9.5 (2.0)	8.6 (2.4)	0.008	8.7 (1.8)	0.1
SHIM score	20.7 (5.8)	21.3 (3.9)	0.4	16.7 (6.4)	0.07
IPSS score	5.8 (5.9)	6.6 (7.2)	0.3	8.3 (7.6)	0.1
CDC HRQOL-4					
Would you say your general health is[c]	2.5 (1.0)	2.6 (1.0)	0.2	2.9 (1.1)	0.2
Mean number of physically unhealthy days	3.5 (6.8)	3.9 (8.2)	0.6	2.8 (8.6)	0.7
Mean number of mentally unhealthy days	6.2 (9.3)	8.4 (10.3)	0.045	9.4 (12.2)	0.2
Caused a pregnancy	278/594 (46.8%)	31/67 (46.3%)	0.5	8/13 (61.5%)	0.3
Diagnosis of infertility	19/596 (3.2%)	3/68 (4.4%)	0.6	0/13 (0%)	0.5
How often to you sit on toilet to just urinate?[d]	1.9 (1.2)	1.7 (1.2)	0.3	1.9 (1.4)	0.9
Penile curvature[e]	1.6 (0.5)	3.0 (0)	<0.001	4.5 (0.5)	<0.001
How difficult did the curvature of your penis make intercourse?[f]	4.9 (0.6)	4.6 (0.7)	<0.001	3.7 (0.8)	<0.001
Have you ever kissed anyone?	571/595 (96.0%)	66/68 (97.1%)	0.7	10/13 (76.9%)	0.001
Age in years	14.2 (4.5)	14.9 (4.8)	0.7	10.5 (3.5)	0.01
Have you ever been in love?	528/593 (89.0%)	57/68 (73.8%)	0.2	10/13 (76.9%)	0.2
Age in years	18.3 (6.0)	17.4 (6.1)	0.3	17.1 (6.5)	0.5
Have you ever had sexual intercourse?	530/597 (88.8%)	59/68 (86.8%)	0.6	9/13 (69.2%)	0.03
Age in years	18.4 (5.1)	17.8 (4.3)	0.4	16.3 (3.5)	0.2
Have you ever masturbated?	583/597 (97.7%)	68/68 (100%)	0.2	12/13 (92.3%)	0.2
Age in years	12.3 (2.7)	12.8 (2.6)	0.1	11.6 (2.6)	0.4

Data presented as mean (standard deviation) or proportion with “yes” answer.

[a] Continuous outcomes compared by student’s *t*-test, ordinal by Wilcoxon rank sum test, dichotomous by chi-square or Fisher Exact test. *p*-Values for mild curvature compared with normal and severe curvature compared with normal.

[b] All questions coded as 3 Z very satisfied; 2 = satisfied; 1 = dissatisfied; 0 = very dissatisfied.

[c] 1 = excellent; 2 = very good, 3 = good, 4 = fair, 5 = poor.

[d] 1 = Almost never or never; 2 = a few times (much less than half the time); 3 = sometimes (about half the time); 4 = most times (much more than half the time); 5 = almost always or always.

[e] Higher number corresponds to more ventral curvature. See Fig. 1.

[f] 1 = did not attempt intercourse; 2 = extremely difficult; 3 = very difficult; 4 = difficult; 5 = slightly difficult; 6 = not difficult.