LOOK ACADEMIC PUBLISHERS
OPEN ACCESS

INTERNATIONAL JOURNAL OF ENVIRONMENTAL & SCIENCE EDUCATION
2016, VOL. 11, NO. 13, 5797-5807

Reducing the Risk of Postoperative Genital Complications in Male Adolescents

Assem Dossanova[a], Vasiliy Lozovoy[a], Dan Wood[b], Kenzhekyz Manekenova[a], Aigul Botabayeva[a], Bolatbek Dossanov[c], Yelena Lozovaya[a] and Talgat Omarov[a]

[a]Astana Medical University, Astana, KAZAKHSTAN; [b]University College London Hospitals, London, UK; [c]National Research Center for Maternal and Child Health, Astana, KAZAKHSTAN;

ABSTRACT

The reproductive system of adolescents is exposed to a high risk of anomalies. In spite of the successes of surgical correction, the percentage of postoperative complications remains high. Special attention should be paid to circumcision, which is regarded as a religious tradition in many countries and carried out with sanitary violations. This research developed a systematic algorithm for the prevention of complications of surgical interventions in case of external genitalia anomalies. The article describes results of a statistical analysis related to the main risk factors of postoperative complications in primary genital surgery in male adolescents. The analysis implied calculating the frequency of value occurrence, the percentage of value occurrence, cumulative frequency. Using the Spearman criterion, we carried out correlation analysis; 11 predicts of complications in the postoperative period during manipulations on the genitals were determined with regard to logistic regression. Comparison of the interdependent variables by using the Chi-square method and the Wilcox on test gave the possibility to determine statistically significant differences in the frequency distribution of patients in terms of complications of the main group. A set of necessary measures for preventing postoperative complications was presented in the form of a prevention circle.

KEYWORDS
postoperative complications, reproductive system, circumcision, webbed penis, hydrocele

ARTICLE HISTORY
Received 19 August 2015
Revised 11 May 2016
Accepted 2 June 2016

Introduction

Postoperative complications related to the external genitalia of male adolescents are found in 2 - 50% of operations, which leads to social and physiological discomfort of children (Higuchi et al., 2016).

CORRESPONDENCE Assem Dossanova ✉ Nugumanchik@inbox.ru

Surgical interventions into the child reproductive system are a last resort in pathology correction. The development of the male reproductive system is associated with a number of anomalies of varying etiology. These include congenital conditions (cryptorchidism, hydrocele, varicocele, and hypospadias), inflammatory processes in the preputium (balanoposthitis), urinary tract infections, and wound infections (Barker & Angsten, 2014). Penoscrotal fusion or "webbed penis" is usually asymptomatic, but unattractive; ergo it can have a possible psychological effect on the person's self-esteem (Lozovoy, Nugumanova & Lozovaya, 2010).

Testis dysfunction causes severe alterations in the child's development, cause discomfort, and increase the risk of infertility (Chan, Wright & Goldstein, 2005). Cryptorchidism is the absence of one or both testes from the scrotum. Surgery is recommended before 15-18 months of age because lack of germ cells is very rare before, and lack of germ cells is associated with subsequent risk of infertility (Cortes, Thorup & Visfeldt, 2001). The risks of original surgeryare associated with the possibility of testicular neoplasia,which is significantly lower during infancy (Caldamone, 2014).

Hydrocelectomy is necessary during the correction of pathological accumulations of fluid in the tunica vaginalis. Primary hydroceles is a congenital condition (Iacono et al., 2014). Secondary hydroceles are the most common cause of benign scrotal swelling with an estimated incidence of 1% in the adult male population (Dabaja & Goldstein, 2014). Hydroceles can develop as a result of infection, tumor, trauma or lymphatic obstruction resulting from nonmicrosurgicalvaricocelectomy. Varicocele is the most common identifiable cause of male infertility and varicocelectomy is the only effective method of treatment (Pajovic et al., 2015).Hydrocelectomy may result in inadvertent injury to the epididymis, vas deferens or testicular blood supply, leading to epididymal obstruction, hematoma, infection, atrophy or recurrence (Dabaja & Goldstein, 2014).

Congenital penis conditions generally require surgical treatment. They have a significant impact on the psychological development of the child and his self-esteem, which is why the correction should be carried out before puberty; the recommended age is 4 to 6 months (Perlmutter, Morabito & Tarry, 2006). Hypospadia is a triad consisting of a malpositioning of the urethral meatus, a ventral curvature of the penis and an abnormal distribution of foreskin, giving a 'hooded' appearance (Snodgrass et al., 2011). The severity of the hypospadias and the number of surgeries required for correction are of primary importance (Woodhouse & Christie, 2005). More complicated types of suprapubic malformations includediastasis, bladder neck abnormalities, and vesicoureteral reflux. Careful preoperative evaluation should allow the identification of these anomalies and will help achieve the goals of surgical reconstruction (Cho & Cendron, 2014).

The webbed penis is a congenital condition in which a web or fold of skin obscures the penoscrotal angle in an otherwise normal-sized penile shaft. There is close terms of the pathology condition, also widely used: penoscrotal webbing, the inconspicuous penis, buried penis, penoscrotal fusion, penoscrotalpterygium and penis palmatus (Montasser, Gohary & Amin, 2010).

Physiological phimosis is a natural condition in which the prepuce cannot be retracted and there is natural adhesion between the glans and the prepuce

(Chan & Wong, 2016). Retractable prepuce develops from birth to the age 17 years. However, cases of true phimosis in adults are indicative of a severe pathology and require surgery (Ko et al., 2007).

The separation of the foreskin from the glans penis is accompanied with a release of smegma from the sebaceous glands of the penis, which serves as a lubricant for the glans penis surface and is an environment for potential development of microorganisms (Gavrina, 2008).

In most cases, circumcision is not a clinical necessity; however, it prevents the above-mentioned risks, since it prevents the accumulation of smegma. In Islam and Judaism, circumcision is obligatory. In Canada, 48% of males are circumcised; 64.1 % of male infants are circumcised in the USA. This surgery is one of the most common ones of the world; at that, the techniques of circumcision are diverse (Lozovoy, Nugumanova & Lozovaya, 2010). Since circumcision is part of a religious cult in many national cultures (Ilyin, Kayumov & Hajrullin, 2016), the procedure is carried out with sanitary violations and by unqualified persons.

Inflammatory complications are more common in cases of operations aimed at circumcision. The results of microbiological studies found that the skin of the external genitalia and perineum heavily colonized by normal skin saprophytes and intestinal microflora: Staphylococcus aureus, epidermidis, diphtheroids, and Streptococcus heamoliticus (Higuchi et al., 2016).

Early postoperative period complications are characterized by the development of the operated organ dyspraxia in the late postoperative period (Chan, Wright & Goldstein, 2005).Vascular damage and subsequent bleeding, lymphostasis and hydrops are the most common postoperative complications [21]. Bleeding in the early postoperative period shows inadequate ligation of vessels or the operation technique. It requires repeated surgical intervention with a view to remove the cause of bleeding[23].

Development of pain after reconstructive plastic surgery on the penis and / or after the circular circumcision is explained by the cavernous body curvature and a flagrant violation of architectonic of the vessels and nerve endings of the penis (Bhat & Mandal, 2008). The presence of adhesions between the balanus and the foreskin can cause the development of pain in adolescents during erection. Their formation is caused by the presence of eroded surfaces on thebalanus and prepuce (Breuer & Walfisch , 1987).

Cicatrical complications are most typical for a circular circumcision (6,7-12%), rarely (1-2%) - for the testicle pull-through operations. Meatal stenosis during circumcision showed in 20% of newborn infants undergoing circumcision,ulceration and epithelial damage of theurethra external opening. In the late postoperative period, after 6 - 12 months, meatal stenosis and violation of urination was diagnosed in 12% of children (Fox & Thomson, 2005).

Data taken from the peer-reviewed publications and official reports of the American Academy of Pediatrics and the European Association of Urology related to complications during operations on the genitals of male adolescents are presented in Table 1.

Table 1. Complications during operations on the genitals of male adolescents

Group of complications	Type of complication	Varicocele	Hydrocele	Cryptor chidism	Hypos-padias	Phimosis	Webbed penis
Solutionofvessel continuity	Hemorrhage	2,8-3,2%	---	1,7-5%	---	---	No reliable data
	Lymphostasis	0,2-9%	---		---	---	
	Hydrops	90%	---	9,7-30	---	---	
	Hematoma	---	---	---	---	0,1-35%	
Infection	Wound purulence	---	---	---	---	---	
	Skin necrosis, gangrene	---	---	---	---	---	
	Sepsis	---	---	---	---	5-9%	
Pain		3-5%	---	---	---	---	
Backset		10-82%	4,2-5,6	10%	---	9,5-12%	
Specific complications	Cicatrical changes	---	---	1-2%	---	6,7-12%	
	Fistula	---	---	---	5-18%	0,5-1%	
	Stenosis	---	---	---	1,3-8,7%	12%	
	Urethra complications	---	---	---	0,14-11,2%	---	
	Webbed penis	---	---	---	---	8-20%	
Dyspraxia of operated organ		5%	---	10%	---	---	

Aim of the Study

To develop a systematic algorithm for the prevention of complications of surgical interventions in the case of external genitalia anomalies.

Research questions

What can prevent postoperative complications after genital surgery?

Method

This study was approved by the Local Ethics Committee of JSC "Astana Medical University" (Astana, Republic of Kazakhstan). A written consent was obtained from the parents when studying the medical records of children.

This paper is based on clinical observation of 1,086 male adolescents aged up to 17 who sought treatment because of congenital abnormalities, external genitalia diseases, or due to postoperative complications, primary surgical procedures identified during the check-ups within the period 2008 - 2014.

Patients were divided into the following groups:

- The main group - children with unsatisfactory results of primary surgical correction of congenital malformations and diseases of the external genitalia (92 patients)
- The control group that consists of children being treated for congenital malformations of the external genitalia (994 patients) (Table 2).

Table 2. Distribution of patients from the main and control groups by type of surgery

No.	Type ofsurgery	Main group	Control group
1	Testiclepull-through	12	254
2	Hydrocele abolition	2	358
3	Varicocele abolition	2	232
4	Circumcision	62	44
5	Abolition of hypospadias	14	47
6	Penis reconstruction (penis exteriorization)	-	59
Totally:		92	994

The studied parameters included: age, the presence of concomitant diseases, reduced reactivity of the organism with a penchant for the development of inflammatory diseases, specifics of primary surgical correction of congenital malformations and diseases related to the external genitalia in male adolescents, surgeon's specialization, local status assessment, methods of primary surgical correction of congenital malformations and diseases of the external genitalia in male adolescents, logistics of the primary surgical treatment of diseases and abnormalities of the external genitalia in male adolescents (if possible), the presence or absence of complications in the early and late postoperative periods.

Given complications related to violations of the blood vessel integrity and operative exploration of postoperative wounds.

Frequency tables were constructed with a view to determine the frequency of quality indicators values. The analysis implied calculating the frequency of value occurrence, the percentage of value occurrence, cumulative frequency. Orders of statistical analysis were explored using different statistical test (Table 3). $P<0.05$ neglected null hypothesis (the absence of differences between the groups). Descriptive statistics were calculated by conventional means. If the distribution was different from normal, the median and 25% -75% of quartile would been calculated. For qualitative characteristics, the mode and 25% -75% of quartile were calculated.

Table 3. Statistical tests using in research

Order	Test
compare the patients between groups with regard to the quality characteristics	chi square test
compare the patients with regard to average index values between the independent groups	Mann-Whitney test (M-W)
linear relationships between pairs of indicators	Spearman's test
dependency of outcome on the values	univariate logistic regression
values of parameters	Shapiro-Wilk (Sh-W)

The sensitivity and specificity of the identified indicators-predictor was assessed by ROC-curves, along with determination of the cut-off thresholds of these indicators, where the sensitivity and specificity would be optimal.

Statistical calculations were performed using the statistical programming R language, version v3.2.0 (R Foundation, USA).

Data, Analysis and Results

The distribution of patients with regard to the analyzed indicators of the general, main and the control group was different from normal (Table 4). The Shapiro - Wilk test for each indicator is reflected. The "Outcome" index mode amounted to 1 (1: 1). The distribution of parameters "Local status", "Therapy", "Conditions", "Specialist", "The choice of method", "Logistics", "Care" was not calculated for the control group since they had no variability. The mode of these indicators made (0, 0).

The analysis carried out by means of logistic regression identified statistically significant predictors of complications when performing surgery on the genitals of male adolescents patients on the averages in the groups.

Table 4. Statistical treatment of patient distribution

Index	Index value Sh-W			Index value M-W	Chi-square	Sensitivity (Se)	Specificity (Spe)	Cut-off point,
	Total	Main group	Control group					
Age	0,86	0,86	0,86	37108,5	616.213	87.1%	38,91%	0,08
Initial diagnosis	0,83	0,66	0,77	20592,0	539.562	64.52%	99,7%	0,17
Repeated diagnosis	0,86	0,67	0,8	20827,5	436.354	64.52%	99,7%	0,16
Medical history	0,15	0,58	-	60137,0	482.871	31.18%	100%	0,53
Comorbidity	0,16	0,37	0,13	50519,0	613.688	13.98%	97,48%	0,08
Localstatus	0,05	0,29	-	49203,0	599.854	7.53%	100%	0,54
Therapy	0,69	-	0,69	-	-	-	-	-
Conditions	0,11	0,51	-	55664,0	537.545	20.43%	100%	0,53
Specialist	0,07	0,36	-	50694,0	584.585	10,75%	100%	0,54
Method	0,06	0,34	-	50197,0	-	-	-	-
Logistics	0,27	0,51	-	81508,0	212.066	76.34%	100%	0,51
Care	0,06	0,34	-	50197,0	589.696	9.68%	100%	0,54
Complications	0,28	0,86	0,01	91356,0	-	-	-	-
Outcome	0,31	-	0,02	91356,0	-	-	-	-

Statistical treatment of pin order to determine the distribution of patients in the sample according to the analyzed indicators, we constructed frequency tables, which gave an idea of the frequency of each feature's occurrence and its cumulative frequency. The chi-square test gave the possibility to determine statistically significant differences in the frequency distribution of patients with regard to the groups (Table 5): patient distribution

Table 5. Frequency distribution of patients with regard to the groups

	Primary and main groups		Primary and control groups	
	Chi-square value	degree of freedom	Chi-square value	degree of freedom
Age	414,7771	144	228, 5179	182
Diagnosis	368	36	372, 5459	140
Complications	29,3037	17	309, 8223	56

By using the Spearman test, we found statistically significant correlations of indices in the general group (primary + control group) (Table 6).

Table 6. Correlation analysis of the general group

Pairs of indices	r	95% CI
Complications – Age	-0,09	[-0,15;-0,03]
Complications – Initial diagnosis	-0,27	[-0,32;-0,21]
Complications – Repeated diagnosis	-0,27	[-0,32;-0,21]
Complications – Medical history	0,53	[0,48;0,57]
Complications - Comorbidity	0,18	[0,12;0,23]
Complications – Local status	0,27	[0,22;0,33]
Complications – Conditions	0,45	[0,4;0,49]
Complications – Specialist	0,32	[0,26;0,37]
Complications – Method	0,3	[0,24;0,35]
Complications – Logistics	0,86	[0,84;0,88]
Complications – Care	0,3	[0,24;0,35]

Thus, weak negative correlation was detected in the pair of indices "Complications" - "Age", i.e., lesser "Age" values correspond to the greater "complications" values and vice versa.

Moderate correlation in pairs "Initial diagnosis" - "Complications" and "Repeated diagnosis" - "Complications" were negative.

The study found weak positive correlation in the pair “Comorbidity" - "Complications".

Positive moderate correlation was found between the indices "Medical history", "Local status", "Conditions", "Specialist", "Method", "Care" in tandem with the "Complications" index.

A strong positive correlation was found between the "Logistics" and "Complications" indices.

Discussion and Conclusion

The previously published studies, revealing the causes of postoperative complications in the correction of congenital malformations of the external genitals and circumcision, presented statistical analysis of the occurrence frequency of certain complications and identification of possible risk factors (Bhat & Mandal 2008; Chan, Wright & Goldstein 2005). In this connection, we attempted to highlight risk factors and analyze the impact of risk factor groups on the development of postoperative complications.

The correlation analysis and the Spearman's provided the possibility to determine statistically significant correlations of indices in the general group. Moderate positive correlation between the data related to the history burdened with preceding genital manipulations and the risk of postoperative complications after repeated reconstructive plastic surgery. Therefore, number of previous surgical interventions influence risk of postoperative complications, as the background of cicatrical changes of connective tissue; the anatomy and blood supply of the operated organ is disrupted. Moderate positive correlation was found among the indices related to local status of the external genitalia. In case of insufficient experience, lack of the required expertise scattered the opportunity to work out specific practical skills. This leads to underestimation of the local status, the revaluation of personal surgical skills, which might result in the violation of surgical intervention techniques along the development of postoperative complications.

The study determined moderate positive correlation between the index of operation conditions and the strong positive correlation between the logistics index and the risk of postoperative complications.

Comparison of the interdependent variables by using the Chi-square method and the Wilcoxon test gave the possibility to determine statistically significant differences in the frequency distribution of patients in terms of complications of the main group. We believe that provided compliance of all predicts with operative treatment standards will increase the rate of favorable outcomes of reconstructive and plastic surgeries.

Observing the significant amount of complications at operative measures on male genital organs, we were forced to reconsider approaches to treatment-and-prophylactic actions during surgical interventions on male genital organs.

Based on the conducted researches, classification of risk factors of development of postoperative complications at operations on male genital organs was created: on a determinant factor and a significance. The algorithm of realization of surgical interventions on male genital organs - “a prophylaxis circle” - was also developed.

Classification

I. On a determinant factor

1. Objective reasons:

• tendency to excessive appearance of connective tissue with cicatricial deformity

• decrease in a responsiveness of an organism with tendency to development of pyoinflammatory complications

2. Subjective reasons:

• surgeon’s professionalism

• violation of technology during operative measures

• underestimation of the local status

• violation of the principles of an asepsis, antiseptics

• approach to selecting a way of surgical correction of defect

3. Technical reasons:

• inadequate suture material

• discrepancy of medical tools to surgical intervention

• absence of an operative wound care.

II. On a significance

1. Factors with highest priority:

• material security of surgical intervention

2. Second group of most important factors:

• anamnesis
• local status
• execution conditions of surgical intervention
• appropriate specialization of the surgeon
• the chosen way of correction of a defect
• post-operative care

3. Third group of most important factors

• provisional diagnosis
• existence of comorbidity
• age of the patient at the correction of a defect.

We proposed a recommendation scheme to prevent postoperative complications after surgical interventions on genitals ("Prevention circle") (Figure 1).

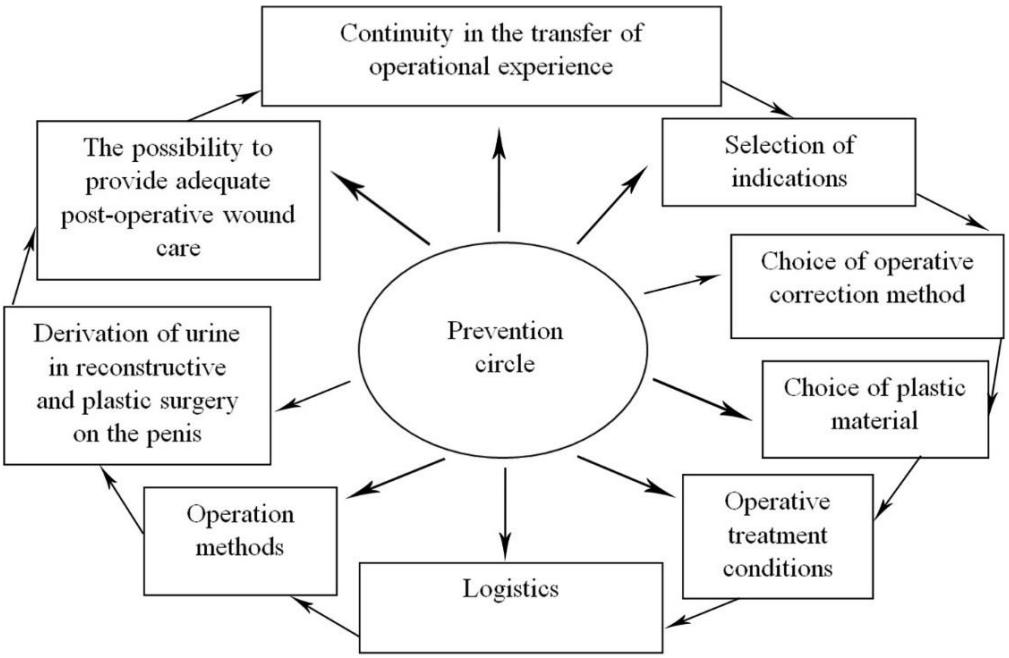

Figure 1. Recommendations to prevent postoperative complications

Implications and Recommendations

Statistical analysis of risk factors related to postoperative complications after surgical correction of congenital malformations of the external genitalia was carried.

The paper provided analysis of the distribution of patients in the sample with regard to relevant indices. All indices calculated by descriptive statistics, and frequency tables.

Frequency tables allowed getting an idea of the frequency abnormalities of the external genitalia in male adolescents, surgical interventions in case of the external genitalia anomalies and postoperative complications.

The statistical analysis found 11 predictors of complications during surgery on the genitals of male adolescents. These included the patient's age, initial diagnosis, medical history and comorbidities, local status specifics, operation conditions, specialist's compliance with the required standards, specific features of the method and logistics during the operation, as well as patient care.

Recommendation scheme to prevent postoperative complications after surgical interventions on genitals ("Prevention circle")were developed.

Set of measures developed to prevent postoperative complications. It will reduce the number of unsatisfactory results of surgical operations on the genitals of male adolescents, thereby providing physiological and psychological comfort for children and promote feasibility of reproductive function in the future.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Assem Dossanova Assistent of Children Surgery Department, Astana Medical University, Astana, Republic of Kazakhstan;

Vasiliy Lozovoy Doctor of Medical Sciences, Professor of Children Surgery Department, Astana Medical University, Astana, Republic of Kazakhstan;

Dan Wood Professor of Adolescent and Reconstructive Urology Department, University College London Hospitals, London, UK;

Kenzhekyz Manekenova Doctor of Medical Sciences, Professor of Pathanatomy Department, Astana Medical University, Astana, Republic of Kazakhstan;

Aigul Botabayeva Candidate of Medical Sciences, Ass.Professor of Children Surgery Department, Astana Medical University, Astana, Republic of Kazakhstan;

Bolatbek Dossanov Candidate of Medical Sciences of Orthopedics Department, National Research Center for Maternal and Child Health, Astana, Republic of Kazakhstan;

Yelena Lozovaya Candidate of Medical Sciences, Ass.Professor of Children Surgery Department, Astana Medical University, Astana, Republic of Kazakhstan;

Talgat Omarov Candidate of Medical Sciences, Ass.Professor of Children Surgery Department, Astana Medical University, Astana, Republic of Kazakhstan.

References

Barker, G., & Angsten, G. (2014). Pediatric Urology - Evidence for Optimal Patient Management. *Acta Paediatria*, 103, 345–345. doi: 10.1111/apa.12505

Bhat, A., Mandal, A.K. (2008). Acute postoperative complications of hypospadias repair. *Indian Journal of Urology, 24*, 241.

Breuer, G.S., & Walfisch, S. (1987). Circumcision complications and indications for ritual recircumcision--clinical experience and review of the literature. *Israel journal of medical sciences,* 23, 252–6.

Caldamone, A.A. (2014). Pediatric Urology: Evidence for Optimal Patient Management. *Journal of Pediatric Urology,* 10, 203.

Chan, I.H., & Wong, K.K. (2016). Common urological problems in children: prepuce, phimosis, and buried penis. *Hong Kong Med J, 22*, 263–269. doi: 10.12809/hkmj154645

Chan, P.T.K., Wright, E.J., & Goldstein, M. (2005). Incidence and postoperative outcomes of accidental ligation of the testicular artery during microsurgical varicocelectomy. *J Urol 173*, 482–4. doi: 10.1097/01.ju.0000148942.61914.2e

Cho, P., & Cendron, M. (2014). The surgical management of male epispadias in the new millennium. *Curr Urol Rep, 15*,1–5. doi: 10.1007/s11934-014-0472-8

Committee On Medical Ethics. (2004). The law and ethics of male circumcision: guidance for doctors. *J Med Ethics*, 30, 259–63.

Cortes, D., Thorup, J.M., & Visfeldt, J. (2001). Cryptorchidism: Aspects of fertility and neoplasms. A study including data of 1,335 consecutive boys who underwent testicular biopsy simultaneously with surgery for cryptorchidism. *Horm Res 55*, 21–27. doi: 10.1159/000049959

Dabaja, A., & Goldstein, M. (2014). Microsurgical hydrocelectomy: Rationale and technique. *Urol Pract,* 1, 189–193. doi: 10.1016/j.urpr.2014.06.003

Fox, M., & Thomson, M. (2005). A covenant with the status quo? Male circumcision and the new BMA guidance to doctors. *J Med Ethics, 31*, 463–469.

Gavrina, D. (2008). Surgical treatment of the foreskin diseases. Synopsis. State Medical Academy, Tver,

Higuchi, T., Holmdahl, G., Kaefer, M. et al. (2016). International Consultation on Urological Diseases: Congenital Anomalies of the Genitalia in Adolescence. *Urology*.

Iacono, F., Ruffo, A., Prezioso, D. et al. (2014). Treatment of bilateral varicocele and other scrotal comorbidities using a single scrotal access: our experience on 34 patients. *Biomed Res Int 2014*, 403603. doi: 10.1155/2014/403603

Ilyin, V.V., Kayumov, A.T., & Hajrullin, A.G. (2016). Values: An Analysis of the Multi-Value World of the Human Personality. *IEJME-Mathematics Education, 11*(5), 1393-1401.

Ko, M-C., Liu, C-K., Lee, W-K. et al. (2007). Age-specific prevalence rates of phimosis and circumcision in Taiwanese boys. *J Formos Med Assoc 106*, 302–7. doi: 10.1016/S0929-6646(09)60256-4

Lozovoy, V., Nugumanova, A., & Lozovaya, E. (2010). The reasons for reoperation after complications of primary urological interventions. *XIV Int. Conf. „Family Heal. - XXI Century“,* 319 – 320. Italy: Rimini.

Montasser, E., Gohary, E., & Amin, M. (2010). O riginal A rticle Webbed penis. *A new classification 15*, 50–53.

Pajovic, B., Radojevic, N., Dimitrovski, A. et al. (2015). Advantages of microsurgical varicocelectomy over conventional techniques. *Eur Rev Med Pharmacol Sci, 19*, 532–538.

Perlmutter, A.E., Morabito, R., & Tarry, W.F. (2006). Impact of patient age on distal hypospadias repair: A surgical perspective. *Urology, 68,* 648–651. doi: 10.1016/j.urology.2006.03.079

Snodgrass, W., Macedo, A., Hoebeke, P., & Mouriquand, P.D.E. (2011). Hypospadias dilemmas: a round table. *J Pediatr Urol, 7,* 145–57. doi: 10.1016/j.jpurol.2010.11.009

Soulie, M., Seguin, P., Richeux, L. et al. (2001). Urological complications of laparoscopic surgery: experience with 350 procedures at a single center. *J Urol, 165*, 1960–3.

Woodhouse, C.R.J., & Christie, D. (2005). Nonsurgical factors in the success of hypospadias repair. *BJU Int, 96*, 22–27. doi: 10.1111/j.1464-410X.2005.05560.x

Yaman, O., Soygur, T., Zumrutbas, A.E., & Resorlu, B. (2006). Results of microsurgical subinguinal varicocelectomy in children and adolescents. *Urology, 68*, 410–2. doi: 10.1016/j.urology.2006.02.022