Variability among Canadian pediatric surgeons and pediatric urologists in the management of cryptorchidism in boys before the publication of major guidelines: a retrospective review of a single tertiary centre

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Background: Before 2014, there was a lack of recommendations on managing cryptorchidism, or undescended testis (UDT), from a large pediatric urological or surgical organization. We assessed the variability in management of UDT among pediatric urologists and pediatric surgeons at a single tertiary pediatric referral centre before publication of major guidelines.

Methods: We performed a retrospective review of the electronic records of patients who underwent primary unilateral or bilateral orchidopexy at our centre between January 2012 and January 2014.

Results: A total of 488 patients (616 testes) were identified, of whom 405 (83.0%) and 83 (17.0%) were managed by pediatric urologists and pediatric surgeons, respectively. There was no difference in baseline characteristics, including age seen in clinic or at surgery, testis location/palpability and availability of preoperative ultrasonograms, of patients seen by the 2 groups. Pediatric surgeons ordered preoperative ultrasonography more often than pediatric urologists (25.3% v. 3.7%, $p < 0.001$). With palpable UDTs, although both groups used open approaches, pediatric urologists preferred a scrotal approach (56.9%), and pediatric surgeons approached most testes inguinally (98.8%). With nonpalpable UDTs, laparoscopic approaches were preferred by both groups; however, pediatric urologists used a 2-stage Fowler–Stephens approach more often than pediatric surgeons (48.4% v. 15.8%, $p < 0.001$).

Conclusion: There was wide variation in the management of primary UDT between pediatric urologists and pediatric surgeons before the publication of guidelines. The most prominent difference between the 2 groups was in the ordering of preoperative ultrasonography. Future assessment of change in practice patterns may elucidate whether guidelines are an effective tool for standardization of practice.

Contexte : Avant 2014, on ne disposait pas de recommandations émanant d'une grande organisation urologique ou chirurgicale pédiatrique pour la prise en charge de la cryptorchidie (absence d'un ou des deux testicules dans le scrotum). Nous avons évalué les divers types de prise en charge de la cryptorchidie chez les urologues et les chirurgiens pédiatriques dans un seul centre tertiaire de référence pédiatrique avant la publication de lignes directrices majeures.

Méthodes : Nous avons procédé à une revue rétrospective des dossiers électroniques de patients ayant subi une orchidopexie unilatérale ou bilatérale primaire dans notre centre entre janvier 2012 et janvier 2014.

Résultats : En tout, 488 patients (616 testicules) ont été identifiés, dont 405 (83,0 %) et 83 (17,0 %) ont été traités respectivement par des urologues et des chirurgiens pédiatriques. On n'a noté aucune différence quant aux caractéristiques de départ des patients vus par les 2 groupes, telles que l'âge lors de la consultation à la clinique ou lors de la chirurgie, la localisation/palpabilité des testicules et le recours à l'échographie préopératoire. Les chirurgiens pédiatriques ont demandé une échographie préopératoire plus souvent que les urologues pédiatriques (25,3 % c. 3,7 %, $p < 0{,}001$). En présence de cryptorchidie palpable, même si les 2 groupes ont utilisé une approche ouverte, les urologues pédiatriques ont préféré l'approche scrotale (55,4 %) et les chirurgiens pédiatriques l'approche inguinale (98,8 %). En présence de cryptorchidie non palpable, les approches laparoscopiques ont été privilégiées par les 2 groupes; toutefois, les urologues pédiatriques ont utilisé une approche Fowler–Stephens en 2 temps plus souvent que les chirurgiens pédiatriques (48,4 % c. 15,8 %, $p < 0{,}001$).

Conclusion : On a noté une grande variation dans la prise en charge de la cryptorchidie primaire entre les urologues et les chirurgiens pédiatriques avant la publication des lignes directrices. La principale différence entre les 2 groupes concernait le recours à l'échographie préopératoire. L'évaluation future des changements affectant la pratique permettrait de déterminer si les lignes directrices sont un outil efficace pour sa standardisation.

Cryptorchidism, or undescended testis (UDT), is one of the most common congenital abnormalities managed both by pediatric urologists and pediatric general surgeons, with a prevalence of 1%–4.6% in term newborn boys. Most congenital UDTs descend spontaneously within the first 3 months of life.[1–3] However, about 1% of boys have persistent congenital UDT, which leads to orchiopexy.[4] Given the association of UDT with infertility and rare malignant diseases, orchidopexy early in infancy has been proposed to minimize these sequelae.[5]

It is established that surgeons' training, comfort and preference — that is, "experience-based medicine" — can often influence their practice.[6,7] This includes different approaches to orchidopexy, which may be performed through the traditional inguinal approach, laparoscopically or via a single-incision technique (Bianchi), depending on testis location and surgeon preference and experience.[8,9] Recent guidelines regarding UDT management from the American Urological Association (AUA),[10] the British Association of Pediatric Surgeons (BAPS)[11] and the Canadian Urological Association (CUA)/Pediatric Urologists of Canada[12] were published after 2014. Moreover, a Choosing Wisely Canada statement for the management of UDT was published by the CUA and the Canadian Association of Pediatric Surgeons in April 2014.[13] Therefore, before 2014, there was a lack of recommendations or consensus in managing UDT from a large pediatric urological or pediatric surgical parent organization. Thus, pediatric urologists and pediatric surgeons may have approached patients differently with respect to their preoperative investigations and/or surgically.[14] We assessed the variability between urologists and surgeons in managing UDT at a single pediatric tertiary care institution before the publication of major guidelines.

Methods

We conducted a retrospective cohort study to review the cases of all patients who underwent primary unilateral or bilateral orchidopexy from January 2012 to January 2014 at a large pediatric referral centre. The study was approved by the institutional research ethics board and was conducted in compliance with the Reporting of Studies Conducted Using Observational Routinely Collected Health Data (RECORD) statement.[15] We acquired the list of all orchidopexy procedures performed at our institution from the institutional surgical informatics specialist database. The eligible cases were identified by diagnosis code of "undescended testicle" or "cryptorchidism," and procedural code of "orchidopexy unilateral" or "orchidopexy bilateral." We excluded repeat orchidopexy, regardless of etiology; orchidopexy indicated for testicular torsion, retractile testis or ectopic testis; and all second-stage orchidopexy procedures performed between January 2012 and January 2014 if the corresponding first-stage procedure was performed before January 2012. The individual patient data were obtained from the operating room electronic medical records and clinical charts. Information reviewed and collected were patient age at time first seen in surgical specialist clinic, patient age at time of surgery, surgical service (urology or surgery), record of preoperative ultrasonography, palpability of the UDT and location, and surgical approach performed. We chose these parameters since they are key features in managing cryptorchidism as discussed in currently available major guidelines.

Statistical analysis

We performed descriptive statistics to summarize the collected data. We categorized the patients according to surgical specialty (pediatric urology or pediatric surgery) and compared the 2 groups. Owing to an unmatched number of samples between groups and nonparametric data set, we performed the Mann–Whitney test to compare the continuous data (age at clinic assessment, age at surgery, median lag time from consultation to surgery). We constructed a contingency table for between-group comparison of all categorical variables (palpability of UDT, frequency of ordering preoperative ultrasonography and frequency of different surgical approaches used) and analyzed them using the Fisher exact test. After coding the categorical variables into numerical forms (e.g., general surgery patient = 1, urology patient = 2), we performed statistical analyses using SPSS version 20.0.0 (IBM Corp.), with assumed 2-sided alternative hypothesis. The level of significance was set at 0.05.

Results

A total of 488 patients were identified, with a total of 616 testes. Pediatric urologists performed surgery in 405 patients/513 testes, and pediatric surgeons performed surgery in 83 patients/103 testes. There was no significant difference between the 2 groups in median age at first clinic visit, median age at surgery, median lag time from initial consultation to surgery or incidence of palpable UDT (Table 1).

The number of preoperative ultrasonograms available at the time of the first evaluation was significantly different between the 2 specialties, at 105 (25.9%) for pediatric urologists and 32 (38.6%) for pediatric surgeons ($p = 0.02$) (Table 2). Moreover, there was a statistically significant difference in the frequency of subsequent ultrasonography examinations ordered by the 2 specialties after the initial evaluation: pediatric urologists ordered preoperative ultrasonography in 15 cases (3.7%), based primarily on obesity or a question of a sexual differentiation disorder, and pediatric surgeons ordered preoperative ultrasonography in 21 cases (25.3%) ($p < 0.001$).

Table 1. Baseline characteristics of the study population

Characteristic	Pediatric urology	Pediatric surgery	*p* value
Patients	*n* = 405	*n* = 83	
Median age at first consultation, mo (IQR)	23 (10–71)	16 (8–49)	0.06
Median age at first surgery, mo (IQR)	31 (15–80)	24 (13–59)	0.09
Median lag time from initial consultation to surgery, mo (IQR)	4 (3–6)	4 (2–9)	0.7
Testes	*n* = 513	*n* = 103	
Median age at time of individual orchidopexy, mo (IQR)	35 (16–83)	25 (13–72)	0.1
No. (%) of palpable UDTs	422 (82.3)	84 (81.6)	0.9

IQR = interquartile range; UDT = undescended testis.

Table 2. Preoperative ultrasonogram availability per patient and ordering physician

Variable	No. (%) of infants: Pediatric urology *n* = 405	Pediatric surgery *n* = 83	*p* value
No. of patients with preoperative ultrasonograms	105 (25.9)	32 (39)	0.02
Preoperative ultrasonography ordered by respective surgical service	15 (3.7)	21 (25)	< 0.001
Specialty of physician ordering preoperative ultrasonography			
General surgery	3 (2.9)	21 (66)	
Urology	15 (14.3)	0 (0)	
Primary care	32 (30.5)	0 (0)	
Pediatrics	30 (28.6)	7 (22)	
Emergency medicine	6 (5.7)	2 (6)	
Hematology/oncology	1 (1.0)	0 (0)	
Endocrinology	0 (0.0)	1 (3)	
Unidentified	18 (17.1)	1 (3)	

Among all surgeons, surgical approaches used for orchidopexy included scrotal, inguinal, laparoscopic 2-stage Fowler–Stephens (first/second stage), combined laparoscopic and inguinal single-stage Fowler–Stephens, open single-stage Fowler–Stephens, laparoscopic single-stage Fowler–Stephens and single-stage laparoscopic without ligation (Table 3). When the UDT was palpable, pediatric surgeons used an inguinal approach in 83 (99%) of 84 cases. In comparison, pediatric urologists used a scrotal (Bianchi) approach in 234 (55.4%) of 422 cases and an inguinal approach in 177 (41.9%).

When the UDT was not palpable, there was no statistically significant difference in the frequency of laparoscopic versus open methods between the 2 groups (p = 0.1): pediatric surgeons used the open approach in 11 (58%) of 19 cases and laparoscopic approaches in 8 (42%). The corresponding values for pediatric urologists (n = 91 cases) were 32 (35%) and 59 (65%) (Table 4). However, there was a significant difference in the frequency of staged versus nonstaged methods for nonpalpable UDTs (p = 0.001): pediatric surgeons used single or nonstaged methods in 16 cases (84%), whereas pediatric urologists

Table 4. Comparison of surgical approaches chosen by pediatric urologists and pediatric surgeons for nonpalpable cryptorchidism

Approach	No. (%) of cases: Pediatric urologists *n* = 91	Pediatric surgeons *n* = 19	*p* value
Laparoscopic exploration	78 (86)	11 (58)	0.01
Laparoscopic	59 (65)	8 (42)	0.08*
Open	32 (35)	11 (58)	
2-stage	44 (48)	3 (16)	0.01†
Single-stage or nonstaged	47 (52)	16 (84)	

*For difference between laparoscopic versus open approach.
†For difference between 2-stage versus single-stage/nonstaged.

Table 3. Surgical approaches used by the 2 groups

Procedure	Pediatric urology; no. (%) of cases: All UDTs *n* = 513	Palpable UDT *n* = 422	Nonpalpable UDT *n* = 91	Pediatric surgery; no. (%) of cases: All UDTs *n* = 103	Palpable UDT *n* = 84	Nonpalpable UDT *n* = 19
Fowler–Stephens methods	61 (11.9)	11 (2.6)	50 (55)	4 (3.9)	0 (0)	4 (21)
Laparoscopic single-stage	5 (8.2)	0 (0.0)	5 (9)	0 (0.0)	0 (0)	0 (0)
Open single-stage	9 (14.8)	8 (72.7)	1 (2)	0 (0.0)	0 (0)	0 (0)
Combined laparoscopic, then inguinal 1-stage	0 (0.0)	0 (0.0)	0 (0)	1 (25.0)	0 (0)	1 (25
Laparoscopic 2-stage	47 (77.0)	3 (27.3)	44 (83)	3 (75.0)	0 (0)	3 (75)
Single-stage laparoscopy without ligation	10 (1.9)	0 (0.0)	10 (11)	4 (3.9)	0 (0)	4 (21)
Open method	442 (86.2)	411 (97.4)	31 (34)	95 (92.2)	84 (100)	11 (58)
Inguinal	198 (44.8)	177 (43.1)	21 (68)	94 (98.9)	83 (99)	11 (100)
Scrotal	244 (55.2)	234 (56.9)	10 (32)	1 (1.0)	1 (1)	0 (0)

UDT = undescended testis.

used a single or nonstaged technique in 47 cases (52%) and a planned 2-stage Fowler–Stephens method in 44 (48%).

There were 5 pediatric urologists and 8 pediatric surgeons performing orchidopexy at our institution. The breakdown of each pediatric urologist and pediatric surgeon's surgical approach for palpable and nonpalpable UDTs is presented in Tables S1 and S2, Appendix 1 (available at canjsurg.ca/014017-a1).

Discussion

Previous attempts to understand practice patterns between pediatric urologists and pediatric surgeons for management of UDT suggest that, when patients are referred to pediatric urologists in US academic centres, the age at referral and volume are higher compared to referrals to pediatric surgeons.[14,16] These results are consistent with our findings. However, we examined practice patterns among 2 groups of surgeons who practise in a single-payer, open-access system where UDT is managed by both specialist groups.

Guidelines may improve patient outcomes through standardization and communication by providing a checklist or protocol that clinicians may follow for a given diagnosis. They are not meant to supercede clinical judgment and management of each patient.[17,24] The most recently published guidelines from the AUA, BAPS and CUA pertaining to UDT contain similar recommendations on management, including the ideal time for surgery, need for preoperative ultrasonography, and approaching the palpable and nonpalpable testes. In addition, Choosing Wisely Canada has recommendations regarding the use of preoperative ultrasonography (Table S3, Appendix 1).[10,11] We studied the variability between pediatric urologists and pediatric surgeons in managing UDT before the publication of these recommendations in an attempt to avoid any influence by them and to see whether there might be variation in practice compared to the guidelines, both within and between surgical specialties. We also wished to examine what opportunity there might be for highlighting the guidelines and strategizing for greater guideline harmonization or, more important, greater specialty practice harmonization in the management of a common diagnosis by 2 specialties at the same institution.

Both the AUA and the BAPS recommend that orchidopexy be performed within the first 18 months of life to maximize fertility potential as the UDT leads to progressive loss of germ cells and Leydig cells.[10,11,18] In our study, the median age at referral and at time of surgery were higher than recommended. However, we did not differentiate the number of primary versus secondary ascended testes, which is known to affect the mean age at treatment.[19] Previous investigations of age of patients with UDT in other countries including the US, Australia and Germany showed that many boys older than the age recommended by guidelines were referred for surgery.[20,16,21] A recent study in Australia indicated that there may be a second peak of UDT in boys aged 5–9 years owing to retractile testes that have developed into acquired or secondary ascended testes.[21] Therefore, the observations from the current study may not truly reflect the age at referral for all primary congenital UDTs. Moreover, the model of primary care practice referral is different in Canada than in the US, with the majority of children being cared for by family practitioners, not pediatricians. This may represent an opportunity for enhanced education for family practitioners in Canada, especially since previous studies have shown that the major reason for delayed management of UDT is late diagnosis.[22,23] Regardless, neither pediatric urologists nor pediatric surgeons at our institution attained the presumed ideal age for referral or treatment of UDT, creating an opportunity for global improvement of care.

All guidelines recommend against ordering preoperative ultrasonography, as the study does not affect clinical decision-making and may increase costs, as well as delay referral and surgery (Table S3, Appendix 1).[10–13] Given the large number of preoperative ultrasonography examinations in our patient population, it is evident that, before the publication of major guidelines, the practice in our community regarding imaging did not reflect the recommendations, especially for patients who were referred to pediatric urologists. However, there was also a lack of compliance with the guidelines within the specialties, with pediatric urologists ordering preoperative ultrasonography in 14% of cases and pediatric surgeons ordering it in 66% of cases. Although preoperative ultrasonography ordered by the specialist may not delay treatment, it is important since there are cost considerations and the potential for misdiagnosis.[25] However, pediatric surgeons may order preoperative ultrasonography to guide their clinical practice. If the imaging results suggest that the testis is below the deep inguinal ring, pediatric surgeons may use open exploration to diagnose UDT in the operating room. This may be reflected in our study: although pediatric urologists used diagnostic laparoscopy at a higher rate than pediatric surgeons, the 2 groups used laparoscopic approaches of orchidopexy at similar rates, which indicates that more pediatric urologists than pediatric surgeons decided to use an open approach after diagnostic laparoscopy. However, in approaching the nonpalpable testis, the AUA guideline states that diagnostic laparoscopy is the preferred method for most pediatric urologists. Similarly, the BAPS and CUA guidelines support the use of laparoscopy for diagnosis of nonpalpable testes.[10–12] Thus, before the publication of these guidelines, pediatric surgeons may have had a different rationale for ordering preoperative ultrasonography, which may have further affected their decision to use diagnostic laparoscopy. Ultrasonography

may or may not have clinical benefits in assessing UDT; however, current guidelines and evidence suggest that ordering of this imaging by the referring physician may delay treatment. Thus, improved discussion and ongoing communication between pediatric urologists and pediatric surgeons, along with radiology colleagues and referring primary care physicians, can help us to understand these differences and to standardize our approach to these patients. As current practice patterns do not reflect clear guideline recommendations, future studies may be necessary to determine whether guidelines are effective tools to change practice patterns of health care professionals in the pediatric surgical setting, as the best currently available evidence suggests.[10–13]

Moreover, for the nonpalpable testis, pediatric urologists performed 2-stage methods in 48% of cases, compared to 16% for pediatric surgeons. This may have been due to experience and expertise among the 2 groups.[26] According to guidelines, both approaches are acceptable, depending on the clinical scenario. Thus, without comparing patient outcomes with future prospective studies, it may be difficult to assess how this difference may affect patients.

For the palpable testis, the AUA and CUA guidelines suggest that either the inguinal or the scrotal approach is appropriate, whereas the BAPS guideline does not specify a procedure of choice. It is interesting to note that the scrotal approach was mainly preferred by 2 of the 5 pediatric urologists at our institution, who operated scrotally and inguinally in more than 70% of cases (Appendix 1). This shows a lack of uniformity within a single specialty. On the other hand, the pediatric surgeon group was consistent in approaching most palpable UDTs inguinally (Appendix 1). Since the scrotal approach was used only once by pediatric surgeons, the question is whether this might be due to a lack of familiarity and comfort with this approach on the part of the pediatric surgeons. Currently, there is no evidence or guideline recommendations suggesting that there are differences in outcomes according to the approach of primary orchidopexy, regardless of whether the indication is unilateral or bilateral UDT. Therefore, assuming that there is no significant difference in costs or outcomes, the lack of uniformity may not be clinically significant, since surgeons may have their preferred approaches, giving them more freedom and control of their practice.

The current study may provide insights into the differences in the management of UDT between pediatric surgeons and pediatric urologists in Canada while prompting further studies that promote more unified care of this condition. In an era of guidelines and evidence-based medicine, where increasing efforts are made to standardize clinical practice, it is important for specialists with different training and skills but who care for similar diagnoses to collaborate in order to determine what indeed provides "best-value practice." A larger survey conducted among major specialty organizations of pediatric urologists and pediatric surgeons would provide national or continental data to further elucidate variations and the rationale for the approaches chosen, and would support or refute the disparate approaches that are evident in our institution. Moreover, it may help us better understand how practice patterns have evolved since the publication of UDT guidelines and Choosing Wisely Canada recommendations. Furthermore, future study of practice variations may affect patient outcomes and subsequently may become the basis for future guideline recommendations.[16]

Limitations

As a retrospective study, this study has inherent limitations of sampling bias, which we minimized by including all patients who had primary orchidopexy performed by pediatric urologists or pediatric surgeons from 2012 to 2014. Our institution employs 5 pediatric urologists and 8 pediatric general surgeons, each with a different number of UDT cases, which may potentially favour certain types of procedures chosen in each group and by specific surgeons (Appendix 1). In addition, pediatric surgeons have an alternative practice site where outpatients at low risk are managed. We did not have access to data regarding management of UDT cases at that facility; although these data may have given more information on pediatric surgeons' management, experience and decision-making, our goal was to assess the management at our single tertiary centre institution. Since the baseline characteristics were similar for the 2 groups, we compared the management of similar populations. We did not include other patient parameters at baseline because all patients included in the study had undergone orchidopexy at our institution given our inclusion criteria. Any patient with comorbidities or syndromes that would have substantially affected a surgeon's decision to manage the condition differently from the gold-standard orchidopexy would have been excluded from the study. Our exclusion criteria also removed patients with other comorbidities that may affect a surgeon's decision by excluding those with different indications for orchidopexy. Thus, it is unlikely that medical comorbidities or syndromes played a large role in the management of UDTs assessed in this study. However, we acknowledge that the lack of comparison of comorbidities may be a limitation in interpreting the results, since there may be unrecognized differences in frequency of such characteristics between the 2 specialist groups. Moreover, we did not evaluate other variables such as cost, although cost-effectiveness may influence a practitioner's management choices, assuming there are no differences in surgical outcomes. Such data are helpful as institutions attempt to standardize approaches to care to provide the greatest value, especially in the resource-limited settings of a single-payer system.

Conclusion

Our results show that there was a wide variation in the management of UDT between pediatric urologists and pediatric surgeons at a single large pediatric referral institution before the publication of major guidelines. The use of diagnostic tools such as ultrasonography and surgical approaches in the management of UDT may not be consistent among various surgical specialists as well as among surgeons within a given discipline.

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