Childhood Obesity

FROM THE GUEST EDITOR

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This issue attacks a growing societal and cultural problem of obesity in children and examines how it affects common pediatric urological problems. The issue has become so significant that Mrs. Obama has endorsed an initiative to address the problem and the AAP has sent an email to its members offering resources on the matter.

As stated in this issue, the problem of obesity in the adult population of the United States seems to have stabilized over the last 5 years; however, it continues to rise in the children. The contributors indicate that obesity may have an effect on certain surgical outcomes parameters of ureteral reimplantation, alter approaches to the common problem of the buried penis, and contribute to the formation and alter the treatment of calculi. The contribution on obesity and the cryptorchid testis indicates that in their experiences obesity did not seem to have an effect on palpability. Of course, the surgical procedures involved in the treatment of the child with obesity are more involved and challenging.

Another interesting question to ponder is whether obesity changes our approach to certain anomalies when faced with management options. For instance, are we more likely to recommend antibiotic prophylaxis or endoscopic correction of vesicoureteral reflux in an obese child compared with a nonobese child? Similarly, does obesity influence the choice of open versus minimally invasive approaches to some abnormalities?

This is a difficult area that is just beginning to get the national attention it deserves. There is no question that obesity will influence the medical field in the decades to come. Our country has produced a generation of overweight children who will develop into a generation of obese adults. This will be a challenge for all physicians, not only pediatricians and pediatric surgeons, but the entire medical field in the years to come.

A recent article in USA Today (Nanci Hellmich, September 24, 2010) revealed that among 33 countries with advanced economies, the United States is the fattest. In addition, the 3 countries with the fastest obesity growth rates are the United States, Australia, and England. Not only does obesity increase the risk of comorbidities, but it costs the United States an estimated $147 billion in weight-related medical bills in 2008. Incidentally, the countries with the lowest obesity rates are Japan, Korea, Switzerland, and Italy. Maybe there is something we can learn from them – diet, life styles, exercise?

This issue of the DPU approaches the obesity dilemma and asks how it affects our practice of pediatric urology. Does obesity affect diagnostic acumen and outcomes of treatment? Does obesity influence our choice of treatment options? For instance, are we more likely to recommend antibiotic prophylaxis or endoscopic correction of vesicoureteral reflux in an obese child compared with a non-obese child? Similarly, does obesity influence the choice of open versus minimally invasive approaches to some abnormalities?

I think that Dr. Roth and his contributors have made a landmark contribution to our awareness of this problem and will likely force many of us to look at our practices for similar effects.
Evaluation and Treatment of the Undescended Testicle in Obese Males

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A number of publications have postulated that obesity adversely affects the accuracy of testicular examination in cryptorchid boys, but have not systematically examined this theory 1, 2. We hypothesized that cryptorchidism in obese boys would in fact be more difficult to diagnose, and sought to test this through a retrospective review.

We assumed that any inguinal testis should in theory be palpable, and that intra-abdominal testes were not. Our patient cohort consisted of boys undergoing orchiopexy or diagnostic laparoscopy for cryptorchidism at the University of California San Francisco Medical Center or the Children’s Hospital of Oakland 3. We excluded any boys with preoperative imaging or prior history of inguinal surgery. Data was collected on morphometric parameters including height, weight, age, race, and laterality of cryptorchidism. Attending evaluations (Drs. DiSandro and Baskin) of testicular location in the outpatient setting were compared to evaluations performed under anesthesia but before skin incision, and intraoperative evaluations. Even if attendings were uncertain regarding the location of specific testes, they made a commitment as to perceived testicular location. Because there are no established BMI-for-age percentiles for children under the age of two, we modified the CDC definitions of childhood overweight and obesity by adding weight-for-height percentiles.

Our cohort consisted of 163 patients and 171 testes (Table 1). The overall mean age was 3.2 years, but 3.8 years for boys with a BMI-for-age percentile of less than 85 versus 2.9 for boys with a percentile greater than 85. Otherwise, there were no apparent differences among boys in different weight classifications.

The concordance between office examinations and examinations under anesthesia was not perfect. Although 131 testes were palpable in the office and under anesthesia, 27 were palpable in the office but not under anesthesia. The predictive value of palpating a testis, whether in the office or under anesthesia, was 93% or higher, regardless of weight classification (Table 3). However, the predictive value of not palpating a testis in overweight boys in the office was only 20%, whereas it was 72% for non-overweight boys. Performing these analyses using raw BMI, i.e., absolute adiposity rather than relative adiposity, did not alter these trends.

There is no published data addressing surgical outcomes in obese, cryptorchid boys. Anecdotally, orchiopexy in this patient population is subjectively difficult, possibly requiring larger incisions and featuring more difficult exposure. Although wound complications are known to occur more frequently in adults undergoing open surgical procedures, we have no data regarding obese boys undergoing orchiopexy. Furthermore, even if obese boys are at higher risk for postoperative complications, the absolute risk may still be low.

In conclusion, obesity does not appear to adversely affect the “palpable predictive value” of testicular examination in boys with suspected cryptorchidism. “Nonpalpable predictive value” also does not seem lower in anesthetized obese boys, but may be lower in awake obese boys. Our findings need to be validated through other surgeons’ series, and data is needed to evaluate orchiopexy outcomes in obese boys.

REFERENCES

| Table 1. Cohort characteristics. Adapted from Breyer et al.3 |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| No. of Total Patients | 161 | 50 | 111 | 36 | 125 |
| No. of Patients with Suspected Unilateral Cryptorchidism | 151 | 47 | 104 | 34 | 117 |
| No. of Patients with Suspected Bilateral Cryptorchidism | 10 | 3 | 7 | 2 | 8 |
| No. of Suspected Cryptorchid Testes | 171 | 53 | 118 | 38 | 133 |
| Mean Age, years (CI) | 3.2 (2.6-3.8) | 3.6 (3.4-4.2) | 2.9 (2.0-3.8) | 3.6 (3.1-4.1) | 3.1 (2.5-3.7) |
| Mean BMI, kg/m² (CI) | 18.1 (17.5-18.7) | 21.5 (20.2-22.8) | 16.6 (16.2-17.0) | 22.4 (21.9-23.0) | 16.9 (16.5-17.3) |
| No. of Atrophic Testes | 13 | 3 | 10 | 2 | 11 |
| No. of Ectopic Testes | 2 | 1 | 1 | 0 | 2 |
| No. of Testes Found to be retractile Under Anesthesia | 2 | 1 | 1 | 0 | 2 |
| No. of Testes Determined to be Absent on Exploration | 2 | 2 | 0 | 2 | 0 |
| No. of Total Patients with Complete Office and Operative Records | 97 | 22 | 75 | n.c. | n.c. |
| No. of Patients with Suspected Unilateral Cryptorchidism and Complete Records | 89 | 20 | 69 | n.c. | n.c. |
| No. of Patients with Suspected Bilateral Cryptorchidism and Complete Records | 8 | 2 | 6 | n.c. | n.c. |
| No. of Suspected Cryptorchid Testes and Complete Records | 105 | 24 | 81 | n.c. | n.c. |
Urolithiasis in the Obese Child

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Obesity represents an increasingly common state with numerous and varied impact on health. Urolithiasis is among the elements impacted, and with the increasing prevalence of stones in younger individuals this problem enters the domain of pediatric urology. While increased imaging in the evaluation of abdominal pain has likely resulted in increased recognition of stones in children, there is likely also an increased true prevalence, as some of these stones ultimately require intervention and would have declared themselves even in a less image driven era. Dietary changes such as increased sodium and those associated with or driving greater body mass are potential contributors to this problem. Obesity is associated with an increased incidence of stones, more “lithogenic urine”, as well as a greater technical challenge in diagnosis and treatment of stones. Herein we will summarize the data available in adults relating to the obesity and stones and what corollary data is found for children.

The increasing risk of urolithiasis with an increasing BMI was convincingly demonstrated through analysis of three prospective health surveys, the Health Professionals Follow-up Study (with a cohort of 45,988 male dentists, optometrists, osteopathic physicians, pharmacists, podiatrists, and veterinarians), the Nurses’ Health Study I (with a cohort of 93,758 women registered nurses), and the Nurses’ Health Study II (with a cohort of 101,877 women registered nurses).

These cohorts are followed prospectively and periodically report health events, including urolithiasis, as well as height and weight by questionnaire. These groups all show a body mass stratified incidence of stones with increasing relative risk of urolithiasis with increasing weight and BMI.1 In an effort to help define potential mechanisms for this change, other studies have defined the composition of the stones, revealing an increased prevalence of uric acid and calcium oxalate stones in those with increased BMI.2 Urinary composition analysis noting inhibitors and promoters of stone formation have suggested increased oxalate, sodium, uric acid, and calcium, as well as decreased citrate and pH, as factors contributing to the risk of urolithiasis3,4 in the overweight and obese. While at first pass this could be construed as merely the increased flux of lithogenic metabolites directly related to the increased consumption linked to obesity (more in more out), there also appear to be metabolic alterations related to insulin resistance found in the obese as well. This metabolic syndrome links glucose intolerance and insulin resistance to increasingly acidic urine, decreased ammonia excretion, and increased urinary Ca excretion, and provides a

(continued on next page)
further additive or multiplicative mechanism for increased stone disease, both uric acid and calcium oxalate based, in this population.\(^5\)

The complexity of management increases in the obese patient. Computerized tomography - the mainstay of adult evaluation - suffers some, though minimal, degradation with increasing body thickness. Other modalities such as plain film and ultrasound are affected to a much greater degree, increasing the need for more complex and higher radiation dose studies to make the diagnosis and increasing the “missed diagnosis” rate when we try to avoid CT imaging. Surgical intervention when required is associated with a greater anesthetic risk. Modalities such as ESWL suffer from a greater attenuation of the shock wave and greater targeting challenge with increasing body thickness. Percutaneous methods are at a greater distance and access portion is technically more demanding. While ureteroscopic techniques are perhaps the least affected by increased mass, positioning difficulties and reduced contrast evident during fluoroscopy compromise our interventions.\(^6\)

In children there has been growing recognition of urinary stones, and that the disease and composition mirrors that seen in adults with a predominance of calcium oxalate.\(^7\) While the classic metabolic disorders are among the etiologic factors found and often present initially in childhood, these are no longer the common causes of childhood stones.

For children in general, risk factor analysis has often focused on solute elements rather than solvent with hypercalcuria, hyperuricosuria, hyperoxaluria, and hypocitruria frequently being noted as etiologic factors.\(^8\) Hypovolemia appears to play a role though it is less frequently a reported component of the analysis in the quest for etiology.\(^9\),\(^10\) In extending observations seen in adults relating metabolic changes with obesity, Sarica obtained 24 hour urines in obese and normal children, observing that there was a greater hypocitruria, hypercalcuria, and hyperoxaluria in the obese children similar to those seen in obese adults.\(^11\)

For those charged with the care of the young, recognition of an increasing incidence of urolithiasis in our patients is important. That some of the dietary changes which favor obesity and the growing prevalence of obesity itself may explain the greater risk of stones in our patients. Intervention directed towards the acute presentation may be required and mirrors practice in adults. While there is not a clear reason to pursue a metabolic evaluation in all children with an initial stone, neither should we follow recurrent disease without effort at stone prophylaxis. This should include defining stone composition and urinary flux of calcium, oxalate, sodium, uric acid, citrate, phosphate, magnesium and volume with efforts to reduce the risks for further recurrence when found. For the urologist involved in metabolic management of these children, emphasis of a risk factor rather than disease model, looking to modify those elements which predict new stones or growth of stones as opposed to defining an aberrant solute as a disease or etiology of urolithiasis has shown beneficial in adults. We need to validate the various different “normal values” being promulgated as predicting the absence of stone recurrence or progression, and be cautious that normalization by weight (rather than creatinine or body surface area, etc) while simple and familiar may obscure problems in an increasingly obese population given the linear relation to weight. Finally appropriate concern expressed to the family regarding the long term impact of obesity on the health of these youngsters and referral for modification will also better serve our patients.

REFERENCES

Obesity - Is It a Factor in the Management of Children Undergoing Ureteroneocystostomy for Reflux?

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Introduction

Children in the United States face a rising tide of obesity. In 2004, 17.1% of U.S. children and adolescents were overweight, as compared to 13.9% of U.S. children in 2000.1 In 2006, a report by the Centers for Disease Control (CDC) demonstrated that after increasing for the last 25 years, the prevalence of obesity in adults has reached a plateau, although the levels remain high. Meanwhile, surveys by the National Center for Health Statistics suggest that obesity among the youth does continue to rise. BMI-for-age growth charts were developed from 5 national data sets used in the National Health and Nutrition Examination Survey (NHANES). In 2000 the CDC utilized these growth charts to define overweight and obesity in children in the United States. Children with BMI-for-age percentiles less than the 85th percentile were categorized as normal weight, at or above the 85th but less than the 95th percentile as overweight, and at or above the 95th percentile as obese (BMI; calculated as weight in kilograms divided by the square of height in meters).2

Childhood obesity is correlated with adverse health outcomes and associated with numerous lifelong obesity-related health conditions.3 The overall prevalence of overweight and obese children (using age-specific criteria) undergoing surgical procedures was 14.4% and 17.2%, respectively.2 In terms of surgical candidates, obese children, similar to their adult counterparts, represent a greater challenge to manage anesthetically, surgically and postoperatively.4 Unfortunately there is a paucity of literature in the pediatric population, especially the pediatric urologic population, on the association of a high body mass index and perioperative complications.

Vesicoureteral reflux is also a significant problem within the pediatric community affecting 1-2% of otherwise healthy children, up to 50% of those presenting with urinary tract infections, and up to 10% of those diagnosed prenatally with hydronephrosis.5 Progress has been made over the last half decade in the diagnosis and management of vesicoureteral reflux. Improvements in diagnosis can be attributed to a better understanding of the pathophysiology and natural history of the disease and development of a standardized International Reflux Grading System which has facilitated succinct interpretation of radiographic studies.6 There is still debate on the optimal management for the various grades of reflux but attempts to devise consensus guidelines continue today with the overall goals to standardize and improve patient care.7 In cases of reflux, where surgery is clinically warranted, an open ureteroneocystostomy remains the gold standard. In general this procedure is well tolerated, with high success rates, and minimal morbidity.

Obesity has previously been shown to increase the risk of anesthetic and surgical complications in the adult population.8,9 Similarly, childhood obesity has been linked to a variety of anesthetic complications.10 However, there have been no reports to date on the effects of childhood obesity on perioperative hospital course and narcotic usage in pediatric urologic patients. Therefore, our objective was to explore the relationship between BMI and the perioperative parameters of hospital stay, OR time, and narcotic use in children undergoing open ureteroneocystostomy for vesicoureteral reflux. We hypothesized that overweight and obese children are at greater perioperative risk than their normal weight counterparts.

Methods

IRB approval was obtained to complete a retrospective case series of 142 open ureteroneocystostomy procedures for treatment of vesicoureteral reflux performed by two surgeons at Baylor College of Medicine/Texas Children’s Hospital between January 2002 and September 2006. Extracted data included patient date of birth, gender, height, weight, preoperative reflux grade, procedure date, OR time, length of postoperative hospital stay, complications, blood loss, non-narcotic and narcotic usage. For the analysis, patient age and BMI were calculated for each patient (Figure 1). BMI was then normalized for each age group and gender using the Centers for Disease Control and Prevention 2000 data on BMI-for-age percentiles. Children with BMI-
for-age percentiles at or above the 85th percentile of the sex-specific BMI growth charts were categorized as overweight/obese. A multivariable analysis was performed to evaluate the impact of BMI for age percentile on length of postoperative hospital stay in nights, OR time, narcotic usage, and estimated blood loss. For the review, only patients aged at least 3 years were included due to the high degree of variability and fluctuation in BMI in children less than 3 years of age. Precise data for estimated blood loss and narcotic use was not available for all patients.

Statistical Analysis

For univariate comparisons, we used the Wilcoxon rank-sum test for continuous variables, and the chi square test or Fisher’s exact test, as appropriate, for categorical variables. Multivariable regression models were constructed using a Poisson distribution and logarithmic function due to the non-Gaussian distribution of the dependent and independent variables. Body mass index (BMI, kg/m^2) was dichotomized at the 85th percentile for age for the purposes of analysis. A sensitivity analysis for the regression models was performed using BMI percentile as a continuous variable. All statistical testing was two-sided with α = 0.05, without correction for multiple testing. Analyses were performed with SAS 9.2 (Cary, North Carolina).

Results

116 patients were considered normal weight with a mean BMI-for-age percentile 36.7 ± 27.9 and 26 were overweight/obese with a mean BMI-for-age percentile 93.3 ± 4.0. The mean age of patients in the normal weight and overweight/obese groups was 5.7 ± 2.4 years and 6.0 ± 2.4 years, respectively. Additionally, the reflux pathology was well matched between the normal weight and the overweight/obese groups. Patient characteristics by BMI >85th percentile are presented in Table 1.

Overweight patients lost more blood (median 30 mL, interquartile range (IQR) 35 mL) than normal weight patients (median 25 mL, IQR 10 mL). Median total narcotic use was also higher among overweight patients, at 4.8 morphine equivalents (IQR 5.0) as compared with 3.2 morphine equivalents (IQR 4.2) for normal weight children. Median operative time was 124 (IQR 72) minutes for normal weight patients, and 117.5 (IQR 77) minutes for overweight children. Median length of stay was the same in both groups (2 days).

We used multivariable models to examine associations between weight classification and perioperative outcomes (Table 2). Controlling for age and sex, estimated blood loss was 21% higher among overweight patients (RR 1.21, p = 0.003). Similarly, total narcotic use was 300% higher among overweight patients, controlling for age and sex. Operative time and length of stay was not statistically different between these groups. Interestingly, patient age and sex demonstrated statistically significant relationships with estimated blood loss, total narcotic use, and operative time.

Discussion

Childhood obesity rates continue to rise in the United States resulting in significant morbidity during childhood and later adult life. Fifty percent of obese children will become obese adults and 75% of obese adolescents will become obese adults. Obesity has been associated with an increased risk of surgical and anesthetic complications in adults undergoing various surgical procedures and in anesthetic complications in children undergoing surgical procedures. However, no published studies to date have evaluated the effects of childhood obesity on perioperative parameters. Obesity may indeed be an important consideration in counseling patients and parents about disease management. For this reason, we performed this retrospective study to assess the relationship between BMI-for-age percentile and perioperative course in children undergoing open ureteroneocystostomy. Our results suggest that overweight and obese patients may be at risk for increased blood loss as well as increased narcotic use when undergoing ureteroneocystostomy. The absolute differences in EBL and narcotic use are small so the clinical significance of the findings is unclear. However, even these small differences highlight the potential implications overweight children may pose on surgeons especially as the BMI-for-age percentiles continue to increase in the pediatric and adolescent populations.

Interestingly, only 6.5% of our study population was obese using the CDC BMI-for-age percentile cutoff at 95%, compared to recent data from the National Health and Nutrition Examination Surveys (NHANES) that reported obesity rates of approximately 15% in a similar population. When one considers that obesity rates in Texas are among the highest in the country with 25-29% of the general population obese based on a BMI ≥30 (CDC Behavioral Risk Factor Surveillance System data 2006) and that Houston consistently ranks as one of the fattest cities in the U.S., this difference in prevalence is surprising. Another explanation for the discrepancy may be that dextranomer microspheres (Deflux®) is being increasingly utilized across the severity grading scale. This means that obese/overweight children may be considered more readily for dextranomer microspheres, which would consequently decrease the number of obese children undergoing open surgery. The study is further limited as it is based on the experience of only two surgeons at a single institution. Thus, our study population may not accurately reflect the current obesity rates due to the referral pattern of the surgeons at our hospital responsible for this population.

Table 1. Patient characteristics by BMI>85th percentile.

<table>
<thead>
<tr>
<th>Patient Characteristic</th>
<th>BMI &lt;85%ile (N = 116)</th>
<th>BMI ≥85%ile (N = 26)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>5.7 (2.4)</td>
<td>6.0 (2.4)</td>
<td>0.453</td>
</tr>
<tr>
<td>Female N (%)</td>
<td>93 (80.2)</td>
<td>23 (88.5)</td>
<td>0.410</td>
</tr>
<tr>
<td>Reflux Grade</td>
<td></td>
<td></td>
<td>0.628</td>
</tr>
<tr>
<td>1</td>
<td>75 (65)</td>
<td>15 (58)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>37 (32)</td>
<td>11 (42)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2 (1.7)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 (1.7)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>BMI, mean (SD)</td>
<td>15.1 (1.5)</td>
<td>20.1 (2.9)</td>
<td></td>
</tr>
<tr>
<td>BMI percentile, mean (SD)</td>
<td>36.7 (27.9)</td>
<td>93.3 (4.0)</td>
<td></td>
</tr>
</tbody>
</table>
A final limitation stems from the retrospective nature of the study. We felt it important to explore the possible relationship between the epidemic of childhood obesity and perioperative course in children since little data is currently available in the literature, especially within the pediatric urologic population. It is clear that obesity portends significant morbidity in the adult population, based on both anecdotal and study evidence. It is less clear what effects the changing landscape with increasing rates of overweight/obesity in the pediatric population will ultimately have on the healthcare system as these children grow into obese adults. The NHANES findings for children and adolescents suggest the likelihood of another generation of overweight adults who may be at risk for subsequent overweight and obesity-related health conditions which must include urologic problems (stone disease, incontinence, erectile dysfunction, as well as others).13-16

Vesicoureteral reflux is a common condition in the pediatric population that may result in significant morbidity and, coupled with the growing list of obesity-related health conditions, is a growing cause for concern. As the number of overweight/obese children continues to increase, pediatric urologists will surely see more of these children. It is important to understand the implications this epidemic may have on surgical management. In a recent study, a large cohort of more than 6,000 adult patients undergoing elective abdominal surgical procedures demonstrated that obesity alone is not a risk factor for complications associated with surgery.4,17 However, it is unwise to assume that these findings can be extrapolated to the pediatric population. Anecdotally, these patients present a greater management problem than their normal-weight counterparts. Prospective studies need to be undertaken to evaluate surgical risks and outcomes in this population in order to facilitate more evidence-based management of obese children in the future.

Conclusions

Vesicoureteral reflux remains a significant disease condition in children and overweight/obesity trends continue upwards in the pediatric population. Definitive management for the treatment of reflux is surgical and advocated in cases unlikely to resolve spontaneously. In this study, we found small differences in perioperative outcomes between overweight/obese children undergoing ureteroneocystostomy versus their normal-weight counterparts. Prospective studies need to be undertaken to evaluate surgical risks and outcomes in this population in order to facilitate more evidence-based management of obese children in the future.

Table 2. Results from multivariable models.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Narcotic Usage*</th>
<th>Estimated Blood Loss*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rel. Risk</td>
<td>95% CI</td>
</tr>
<tr>
<td>Age</td>
<td>1.27</td>
<td>1.24-1.32</td>
</tr>
<tr>
<td>Female</td>
<td>0.41</td>
<td>0.34-0.50</td>
</tr>
<tr>
<td>BMI &gt; 85th %ile</td>
<td>3.05</td>
<td>2.49-3.74</td>
</tr>
</tbody>
</table>

*Data only available for 63 of 142 patients.

REFERENCES

Buried Penis: The Impact of Childhood Obesity

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The problem of childhood obesity is an issue of epidemic proportions. The overall impact of obesity on the general health of children is eliciting a general call to action amongst physicians who care for children. Even nonphysician groups, such as the National Football League (NFL), recognize the adverse impact of obesity on children’s health and are encouraging regular daily exercise to combat obesity.

As physicians we are asked to evaluate boys whose penis is less evident appears smaller than they or their parents think is normal. Many of these boys are obese and the real challenge is discerning the child with a normal penis that is simply recessed or hidden in an excessively fatty mons pad from the boy with a truly pathologic penis.

So, what is a truly buried penis? What are the anatomic features that lead to a buried penis? Most authors refer to a lack of attachment of the shaft skin and dartos fascia to the underlying Bucks fascia. Some describe thickened dartos fascia tethering the penis causing the skin to droop over the glans and others deny an abnormality of the dartos fascia and site shortened shaft skin and penile length.

I have observed in cases of primary buried penis (no prior surgery or obesity) that the shaft skin is foreshortened. That is to say, the distance from the origin of the shaft skin at the mons to the preputial ring is very short and the preputial ring is phimotic. Overall, there is a definite paucity of normal shaft skin and there is no attachment of the skin at the penopubic junction to Bucks fascia.

Intraoperatively, we invariably find an abundance of inner preputial skin which becomes evident once the phimotic ring is incised. Releasing the dartos attachments that tether the penis allow it to come “out to length”. I have not been impressed that the corpora of these penises are intrinsically short. During the procedure essentially the entire shaft is resurfaced with inner preputial skin, and I agree with the concept that fixation of the shaft skin to the corpora at the base of the penis is critical to a successful outcome.

The other group of boys presenting with a hidden penis are those who have had a circumcision. The site of the circumcising incision undergoes cicatricial contracture and the glans is trapped beneath it. I think at times this outcome is the consequence of a circumcision being performed on an unrecognized buried penis. Less frequently, I suspect an overzealous skin excision was performed.

During release of this type of trapped penis, we usually observe that the shaft skin is generally quite short and once the cicatricial scar is opened and excised there is usually enough inner preputial skin to adequately resurface the shaft. These findings lead me to suspect that most of these cases are the result of circumcisions performed on an unrecognized buried penis. Infrequently, after multiple prior “circum-cisions” or scarring from balanitis xerotica obliterans (BXO) the shaft and inner preputial skin are so deficient or scarred that the shaft skin needs to be replaced by a STSG.

Physical examination should allow one to differentiate the truly buried penis from a concealed penis due to obesity. When the fatty mons is depressed and the penis is “extruded” in the boy with a concealed penis due to obesity, it is evident that the proximal shaft skin is fixed at the base of the penis and the shaft skin has a normal length. This is distinctly different from the buried penis in which pushing down on the mons does not make the penis evident as it simply tightens the deficient shaft skin.

My operative approach to the buried penis is straightforward. Initially, I incise the phimotic ring on the ventral aspect of the penis. The glans is extruded and held with a stay stitch. I then excise the entire phimotic ring sacrificing only a millimeter or 2 of skin on either side of it. We release the dartos fascia from the penis proximal to the circumcising incision. This makes the penis more evident. I fix the skin at the junction of the shaft skin andmons to the corpora at the 3 and 9 o’clock positions with PDS with the penis pulled out to its actual length. The inner preputial skin is then extensively tailored to resurface the shaft. A ventrally positioned midline closure facilitates this process.

Mons lipectomy or liposuction is an adjunct to penile release that I believe should be used in selected patients. I have performed mons lipectomies when resurfacing the shaft with a STSG to prevent engulfment of the graft in the fatty mons. A lipectomy was useful for the same reason in an obese boy with severe hypospadias who required reoperative surgery with buccal mucosal grafting. Consideration could also be given to surgical management of the fat in the obese boy who has a truly buried penis.

My initial approach to the boy with a concealed penis resulting from obesity is to suggest lifestyle changes to promote exercise and dietary adjustments. I refer these boys to our pediatric team that specializes in obesity management. Many of the mothers of these preteen and early teen boys recognize the psychological impact the penile issue is having on their son and they offer to exercise with their son and modify the family diet. These efforts offer the support many boys need to succeed.

Although initiating and following lifestyle changes that includes dieting is difficult I have found the carrot that the hope for an evident penis provides some boys with the motivation they need to succeed. I see these boys back in follow-up to encourage their successes. Fortunately, pubertal development often incites enough penile growth and loss of baby fat that the issue resolves.

The etiology of the hidden penis is variable. The buried and trapped penis are surgical problems with straightforward solutions. The concealed penis due to obesity is rarely a surgical problem and its successful management demands a patient, supportive, multidisciplinary approach.