



Adolescent varicocele: A large multicenter analysis of complications and recurrence in academic programs

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Keywords
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Abbreviations
CPTCurrent Procedural Terminology; E&MEvaluation and Management; FPSCFaculty Practice Solutions Center; ICD-9International Classification of Disease 9th edition; PEpercutaneous embolization

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Summary

Objective

After varicolectomy a wide range of recurrence rates have been reported from 0 to 18%, and rates of post-operative hydrocele formation between 0 and 29%. Controversy exists as to the appropriate approach for varicocele treatment, whether open, laparoscopic, or percutaneous embolization (PE) is best for young men. The literature on treatment of adolescent varicocele is limited to high-volume single surgeon, single institution, or small multi-institution series. Our goal was to evaluate the retreatment and complication rates from numerous institutions to determine more generalizable results.

Study design

The Faculty Practice Solutions Center database was queried to identify males under age 19 years with a diagnosis and/or treatment of varicocele between January 2009 and December 2012. Patients were followed until December 2013 (1–5 years follow-up) to determine if they had occurrence of outcome variables: retreatment, diagnosis, or treatment of hydrocele. Associations of the variables age, race, insurance type, geographical region, surgeon-volume, and surgical approach, with outcome variables were analyzed using a mixed-effects Cox proportional hazard model.

Results

Of 6,729 patients with a diagnosis of varicocele, 1,036 underwent open (405), laparoscopic (530), or percutaneous embolization (PE) (101) treatment by 213 physicians. Retreatment rates after open,

laparoscopic, and PE treatments were 1.5%, 3.4% and 9.9%, respectively. Race, region, insurance type, and age were not independently associated with outcomes. The incidence of hydrocele after open, laparoscopic, and PE treatments was 4.9%, 8.1%, and 5%, respectively. No approach was independently associated with diagnosis or treatment of hydrocele. Young age was associated with a significantly higher rate of hydrocele formation. For each year of age, there was a 14% decreased rate of hydrocele formation.

Discussion

Although this series contains the largest cohort of patients, physicians, and institutions, we were limited by the inability to determine actual recurrence rates. Only patients receiving retreatment at the same institution within the 1–5 year follow-up period were captured. As such, the true rate of varicocele recurrence may be higher. The retreatment rate is influenced by the physician's threshold to retreat and the patient's desire to undergo another procedure. Despite its limitations, this is the first study to compare open, laparoscopic, and percutaneous approaches to varicocele treatment.

Conclusions

Percutaneous embolization has a significantly higher retreatment rate compared with either open or laparoscopic varicolectomy. Retreatment and hydrocele formation after open and laparoscopic approaches were not significantly different. This supports a surgeon and family choosing an approach based on patient characteristics and surgeon preference.

Introduction

Varicocele is the most common cause of male infertility and one of the most common surgically correctable urological abnormalities among adolescent males [1–3]. Between 15% and 30% of male adolescents have a varicocele [1,2,4–6]. The presence of varicocele can lead to testicular hypotrophy and long-term impact on spermatogenesis [7]. Varicocele presence has been associated with lower sperm density, motility, and changed morphology [8]. After repair of varicocele, studies have reported catch-up growth of the hypotrophic testicle in 40–100% of patients and improvement in sperm density and motility [8,9]. Hence, it is a potential source of infertility that is both identifiable and treatable in the prepubescent. Yet, only about 20% of boys with varicocele will experience long-term fertility effects [10]. In addition, the treatment of varicocele in adolescents and prepubescents is not without risk, including persistence or recurrence of varicocele, formation of hydrocele, and injury to the testicle.

After varicocelectomy a wide range of recurrence rates have been reported from 0 to 18%, and rates of post-operative hydrocele formation between 0 and 29% [1]. Variations in these reported rates could be a result of surgical approach, age, or length of follow-up in these studies. Controversy exists as to the appropriate approach for varicocele treatment. Multiple studies have been published regarding the operative technique, such as inguinal, subinguinal, lymphatic sparing, and artery sparing. More broadly, there is controversy over whether to approach varicocele through an open, laparoscopic, or percutaneous embolization (PE).

Despite the controversy, to our knowledge, all but one published series have been limited to single institutions and/or high-volume surgeons, limiting the ability to generalize results, and therefore, to help guide parents and patients in the question of whether to pursue an open, laparoscopic, or percutaneous approach [11]. In addition, few studies have compared the three broad categories of approaches. Therefore, our objective was to perform a multicenter analysis to determine the rates of recurrence and hydrocele formation after open, laparoscopic, and percutaneous treatment of varicocele to better counsel patients and parents. We hypothesize that these rates will not be equivalent to larger volume centers. To our knowledge, this study represents the first analysis of such magnitude and is the first to compare all three broad categories of treatment approaches on a large scale.

Materials and methods

To identify patients with a varicocele we queried the Faculty Practice Solutions Center (FPSC) database. FPSC was initiated by an alliance between the University Health System Consortium and the Association of American Medical Colleges in an effort to collect benchmarking data on academic clinical practices throughout the country. It involves more than 90 participating faculty practice plans with more than 60,000 physicians nationwide. Coding data analyzed include de-identified hospital and provider codes, patient date of birth, gender, race, physician specialty, CPT

procedural billing codes, ICD-9 diagnosis billing codes, service date, region, and payer category. FPSC is unique not only for its large scale of data capture, but also for its role in tracking billing information which offers a more accurate reflection of practice patterns.

Male subjects under the age of 19 years with a diagnosis of varicocele based on an ICD-9 code of 456.4 for any visit between January 1, 2009 and December 31, 2012 were identified in the FPSC database to determine if they had treatment for varicocele with open surgery (CPT 55530), laparoscopic surgery (CPT 55550) or percutaneous embolization (PE) (CPT 37204, 75894, 36001, 37241, 36012, 36011, 36470, 36478, 37765, 37766, 37244, 35476, or 37799). There is no unique code for PE. Therefore, all potential CPT codes for percutaneous venous interventions in patients with ICD-9 diagnosis of varicocele were included for analysis of PE.

Type of intervention was analyzed by age at primary surgery, insurance type, race, region, and surgeon volume using a mixed-effects logistic regression model, fitted using the `glmmPQL` function in R [12]. The database was queried to determine if any patient had an admission or anesthetic within 48 h of the procedure.

To ensure a minimum of 1 year of follow-up, patients were followed in the database from the date of primary treatment (January 2009 to December 2012) through December 31, 2013 to discover any retreatment of varicocele, a new diagnosis of hydrocele (ICD-9 603.X), and/or treatment of hydrocele (CPT 55000, 55040, 55041, or 55500).

As the 5-year study was a prevalence analysis, a subset analysis was performed to determine treatment (incidence) rate. New patients seen by a urologist in the first 2 years of the study period (January 2009 to December 2010) were identified and followed to better define any treatment during the ensuing 3–5 years (until December 2013).

Time to retreatment was compared between surgical approaches, controlling for age at primary surgery, race, insurance type, region, and surgeon volume using a mixed-effects Cox proportional hazard model including random effects for surgeon and institution. Time to treatment for hydrocele from time of varicocele treatment was likewise compared between surgery types, controlling for age at primary surgery, surgeon volume and insurance type using a mixed-effects Cox model. Mixed-effects Cox models were fitted using the package `coxme`, version 2.2-3 in the statistical computing environment R, version 3.1.0. Time to retreatment of varicocele was plotted by primary surgical approach (without covariate adjustment) using Kaplan–Meier curves.

Results

The query identified 6,729 boys and young men with the diagnosis of varicocele of whom 1,006 received treatment, open (405), laparoscopic (530), and PE (101). Surgical patients were treated by 175 urologists and 38 interventional radiologists. Bilateral procedures were performed in only 46 open (11%), 27 laparoscopic (5%), and two PE (2%) patients, or approximately 7.5% of the patients. We found no occurrence of readmission or secondary anesthesia within 48 h of primary treatment.

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