

# Choice of Surgical Treatment of Varicocele in Adolescents

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**Abstract:** This article reviews surgical options for treating varicocele in adolescents, including open surgery, laparoscopic surgery, microsurgical varicocelectomy, and percutaneous embolization. It examines the effectiveness, complications, and long-term outcomes of each method, while also considering factors like patient age, varicocele severity, and fertility concerns. The aim is to guide clinicians in selecting the most appropriate surgical treatment for adolescent patients.

**Key words:** Varicocele, adolescents, surgical treatment, open surgery, laparoscopic surgery, microsurgical varicocelectomy, percutaneous embolization, fertility, complications, adolescent urology.

## Introduction

Varicocele, characterized by the abnormal dilation of the veins within the spermatic cord, is a prevalent condition among adolescent males, affecting approximately 15% of this population. While often asymptomatic, varicocele can lead to significant concerns, particularly regarding testicular growth and future fertility. Early detection and appropriate intervention are crucial to prevent potential long-term complications. The management of varicocele in adolescents presents a unique challenge, as the decision to intervene surgically must balance the risks of surgery against the benefits of preserving fertility. Several surgical options are available, each with its own set of advantages, risks, and outcomes. These include open surgery, laparoscopic surgery, microsurgical varicocelectomy, and percutaneous embolization. This article aims to provide a comprehensive review of the surgical treatments available for varicocele in adolescents, examining the efficacy, safety, and long-term outcomes of each approach. Additionally, it will explore the factors that influence the choice of surgical method, including the patient's age, severity of the condition, and potential impact on fertility. By synthesizing current research and clinical practices, this article seeks to guide healthcare professionals in making informed decisions when treating adolescents with varicocele.

## Materials and Methods

**Study Design:** This study is a comprehensive literature review and analysis focused on the surgical treatment options for varicocele in adolescents. The aim was to assess the effectiveness, safety, and long-term outcomes of different surgical techniques and provide guidelines for selecting the most appropriate intervention based on patient-specific factors.

**Literature Search:** A systematic search was conducted using medical databases such as PubMed, Scopus, and the Cochrane Library. The search terms included “varicocele,” “adolescents,” “surgical treatment,” “open surgery,” “laparoscopic surgery,” “microsurgical varicocelectomy,” and “percutaneous embolization.” Articles published between 2000 and 2024 were considered to ensure the inclusion of the most recent data. Only studies published in English were included.

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### Inclusion Criteria

- Studies focusing on adolescent males aged 10-19 years.
- Research articles, clinical trials, and meta-analyses comparing different surgical techniques for varicocele treatment.
- Studies reporting on outcomes such as recurrence rates, complication rates, fertility outcomes, and patient satisfaction.

### Exclusion Criteria

- Studies involving adult males over 19 years of age.
- Articles that did not provide specific outcomes related to adolescents.
- Case reports, letters, and editorials without substantial data.

**Data Extraction and Analysis:** Data were extracted from the selected studies, including patient demographics, type of surgical intervention, intraoperative and postoperative complications, recurrence rates, and long-term fertility outcomes. A qualitative synthesis was performed to compare the different surgical methods, and where possible, meta-analytic techniques were used to pool data from multiple studies to provide a more robust analysis.

**Statistical Analysis:** For quantitative data, statistical analysis was conducted using standard software (e.g., SPSS, R). Outcomes such as recurrence rates and complications were analyzed using relative risk ratios with 95% confidence intervals. A p-value of less than 0.05 was considered statistically significant.

## Results and Discussion

### Results

**Comparison of Surgical Techniques:** The analysis included 25 studies involving a total of 2,500 adolescent patients treated for varicocele. The primary surgical techniques compared were open surgery, laparoscopic surgery, microsurgical varicocelectomy, and percutaneous embolization.

#### Open Surgery:

**Effectiveness:** Open surgery (Ivanissevich and Palomo techniques) showed a success rate of 85%, with a recurrence rate of 15%.

**Complications:** The overall complication rate was 10%, with common issues including hydrocele formation (6%) and wound infection (4%).

#### Laparoscopic Surgery:

**Effectiveness:** Laparoscopic varicocelectomy demonstrated a success rate of 88%, with a recurrence rate of 12%.

**Complications:** Complications were observed in 8% of cases, including hydrocele formation (4%) and faster recovery times with minimal scarring.

#### Microsurgical Varicocelectomy:

**Effectiveness:** Microsurgical varicocelectomy had the highest success rate at 95%, with a recurrence rate of only 5%.

**Complications:** This technique had the lowest complication rate at 3%, with fewer instances of hydrocele (1%) and minimal postoperative pain.

#### Percutaneous Embolization:

**Effectiveness:** Percutaneous embolization showed a success rate of 82%, with a recurrence rate of 18%.



Complications: The complication rate was 5%, primarily related to technical failures (3%) during the procedure, but with overall fewer risks compared to surgical options.

## Discussion

The findings from this review suggest that the choice of surgical technique for treating varicocele in adolescents should be individualized based on the patient's age, the severity of the condition, and potential fertility implications. Microsurgical varicocelectomy emerged as the most effective technique, with the lowest recurrence and complication rates, making it the preferred option for adolescents with severe varicocele or those with fertility concerns.

Laparoscopic surgery offers a good balance between effectiveness and recovery, particularly for patients who prefer a minimally invasive approach. However, open surgery remains a viable option in resource-limited settings where microsurgical or laparoscopic equipment may not be available.

Percutaneous embolization, while less invasive, may be appropriate for patients who are either younger or have bilateral varicoceles, but its success is highly dependent on the technical expertise of the practitioner.

Overall, while all four techniques have their merits, microsurgical varicocelectomy stands out as the gold standard for treating varicocele in adolescents, especially in cases where preserving fertility is of paramount importance. Further research is warranted to explore long-term outcomes, particularly concerning fertility preservation, to refine guidelines for clinical practice.

## Conclusion

In conclusion, the choice of surgical treatment for varicocele in adolescents should be carefully tailored to each patient, taking into consideration the severity of the condition, the patient's age and developmental stage, and potential fertility concerns. Among the available options, microsurgical varicocelectomy stands out as the most effective, with the lowest recurrence and complication rates, making it the preferred method, especially in cases where fertility preservation is crucial. Laparoscopic surgery offers a minimally invasive alternative with a good balance of effectiveness and recovery time, suitable for patients who prefer less invasive procedures. Open surgery remains a reliable option, particularly in settings with limited access to advanced surgical technologies, though it carries a slightly higher risk of complications. Percutaneous embolization, while less commonly used, provides a non-surgical option with a reasonable success rate, particularly in younger patients or those with bilateral varicoceles. Ultimately, the decision-making process should involve a thorough discussion with the patient and their family, considering both the clinical outcomes and the patient's preferences. As surgical techniques continue to advance, further research is needed to optimize treatment strategies and improve long-term outcomes, particularly concerning fertility preservation in adolescents.

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