The Great Debate: Varicocele Treatment and Impact on Fertility

A Case Study

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Objectives for today's session

- Define varicoceles and summarize their role in male infertility
- Describe the effects of varicoceles on sperm quality to support clinical understanding
- Identify available treatment options for varicoceles in reproductive health settings

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What is a varicocele?

- Abnormal dilation of the veins in the scrotum
  - Pampiniform plexus
- The veins are responsible for transporting oxygen-depleted blood from the testicles back to the heart
- When blood pools in the veins rather than circulating efficiently out of the scrotum, varicoceles occur

Mayo Clinic. (2017). *Varicocele - Symptoms and causes*. Mayo Clinic. https://www.mayoclinic.org/diseases-conditions/varicocele/symptoms-causes/syc-20378771

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What is a varicocele?

- Can be observed in both fertile and infertile men
- Most commonly occur on the left side
- Can be unilateral or bilateral

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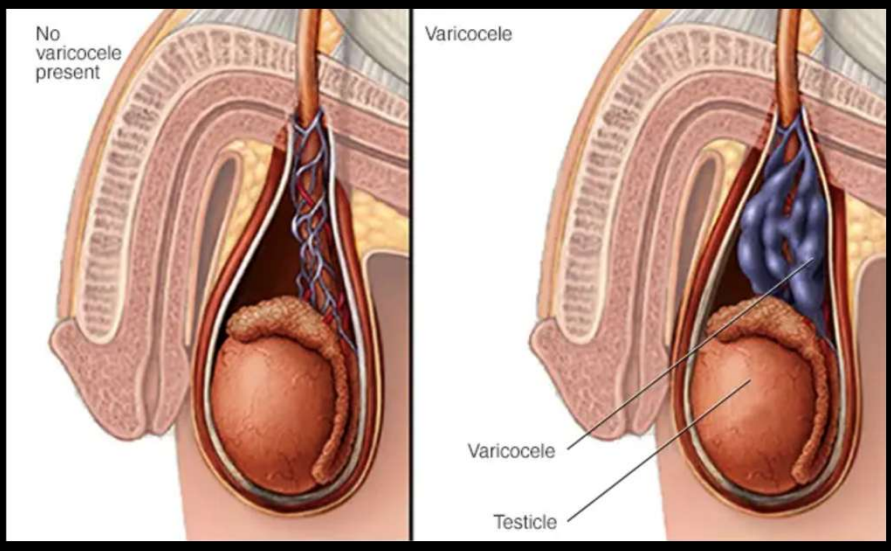
No varicocele vs varicocele



Mayo Clinic. (2017). *Varicocele - Symptoms and causes*. Mayo Clinic.

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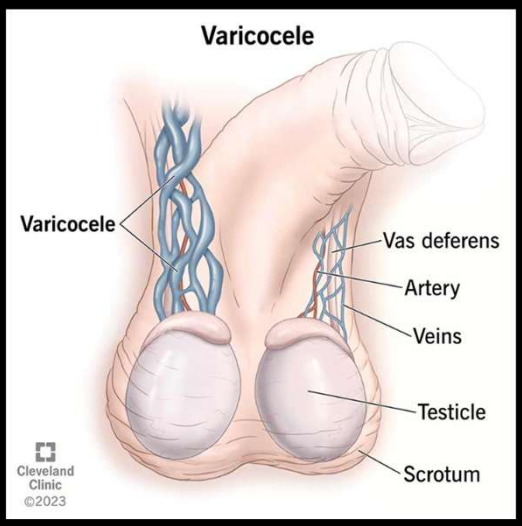
Varicocele vs No varicocele



Cleveland Clinic. (2023, March 30). *Varicocele: Testicle Pain, Symptoms, Treatments, Male Infertility*. Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/15239-varicocele

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How common are varicoceles?

- Approximately 15% of all healthy, adult males have a varicocele
- Up to 35% of men with primary infertility will exhibit a varicocele
- Up to 80% of men with secondary infertility will experience varicoceles
- Nearly 20% of adolescents have varicoceles, a portion of those will spontaneously resolve

Alsaikhan, B., Alrabeeah, K., Delouya, G., & Zini, A. (2016). Epidemiology of varicocele. *Asian Journal of Andrology*, *18*(2), 179–181. https://doi.org/10.4103/1008-682X.172640

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Associated problems with varicoceles

- Impaired infertility
  - Azoospermia
- Decreased testosterone production by the testis
  - Reduced sex drive
  - Decreased muscle mass
  - Depression
- Scrotal discomfort

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Varicocele grading

Sarteschi/Liguori Classification

- Grade I
- Grade II
- Grade III
- Grade IV
- Grade V

Dublin Grading System

- Grade I
- Grade II
- Grade III

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Varicocele grading

Dublin Grading System

- Grade 1
  - Not visualized
  - Only palpable with Valsalva maneuver
- Grade 2
  - Palpable without Valsalva maneuver
- Grade 3
  - Visible while patient is standing

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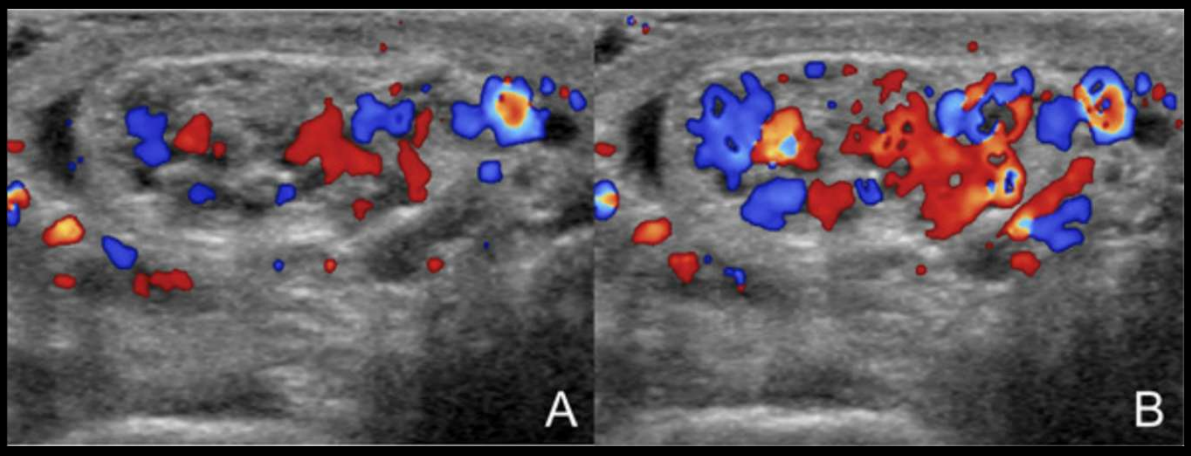
Grade 1



Bertolotto, M., Cantisani, V., Drudi, F. M., & Lotti, F. (2021). Varicocoele. Classification and pitfalls. *Andrology*, *9*(5), 1322–1330. https://doi.org/10.1111/andr.13053

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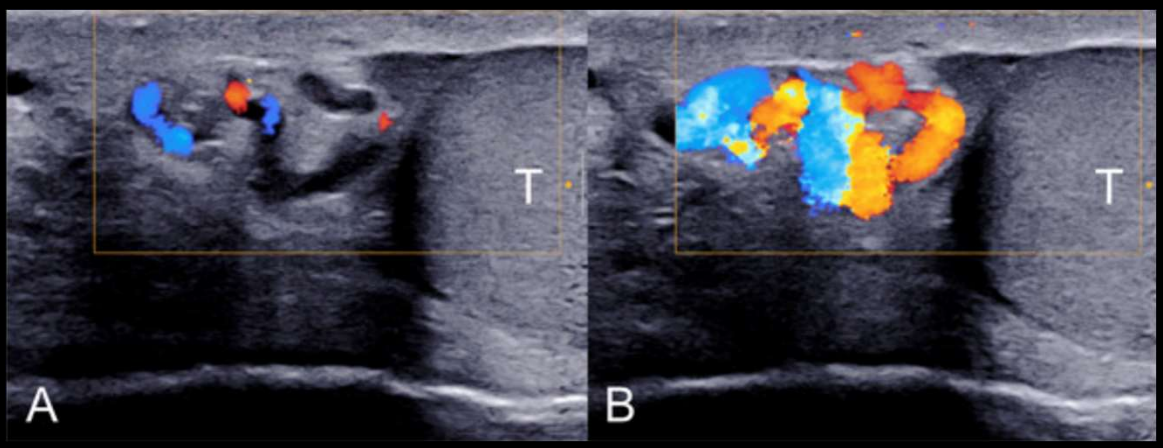
Grade 2



Bertolotto, M., Cantisani, V., Drudi, F. M., & Lotti, F. (2021). Varicocoele. Classification and pitfalls. *Andrology*, *9*(5), 1322–1330. https://doi.org/10.1111/andr.13053

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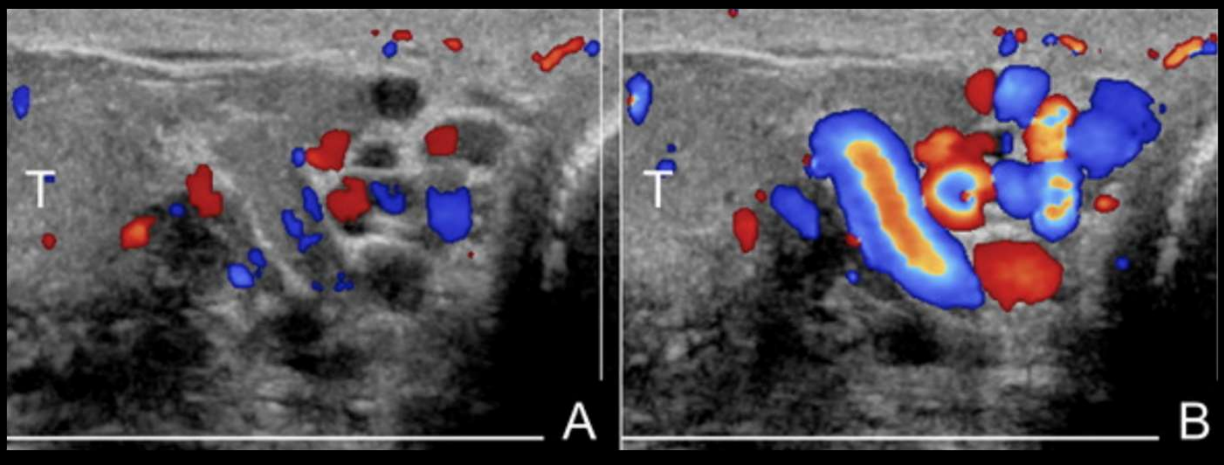
Grade 3



Bertolotto, M., Cantisani, V., Drudi, F. M., & Lotti, F. (2021). Varicocoele. Classification and pitfalls. *Andrology*, *9*(5), 1322–1330. https://doi.org/10.1111/andr.13053

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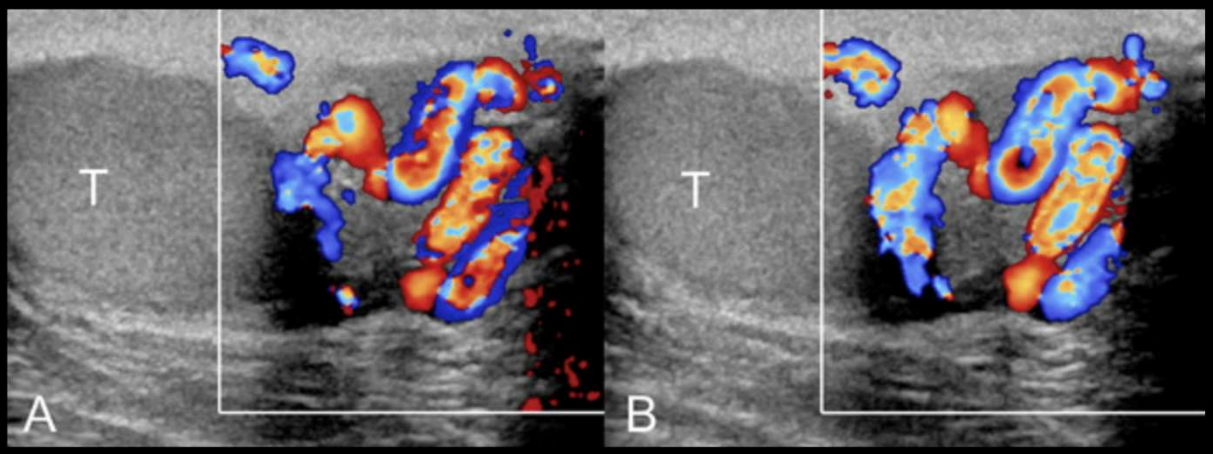
Grade 4



Bertolotto, M., Cantisani, V., Drudi, F. M., & Lotti, F. (2021). Varicocoele. Classification and pitfalls. *Andrology*, *9*(5), 1322–1330. https://doi.org/10.1111/andr.13053

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Grade 5

- Dilated veins in supine and standing positions
- Veins that do not increase in size with Valsalva maneuver
- Reflux at rest, does not increase during Valsalva
- Intratesticular varices may be present

Radiopaedia.org. (2026). Radiopaedia. https://radiopaedia.org/articles/sarteschi-classification-of-varicoceles?lang=us

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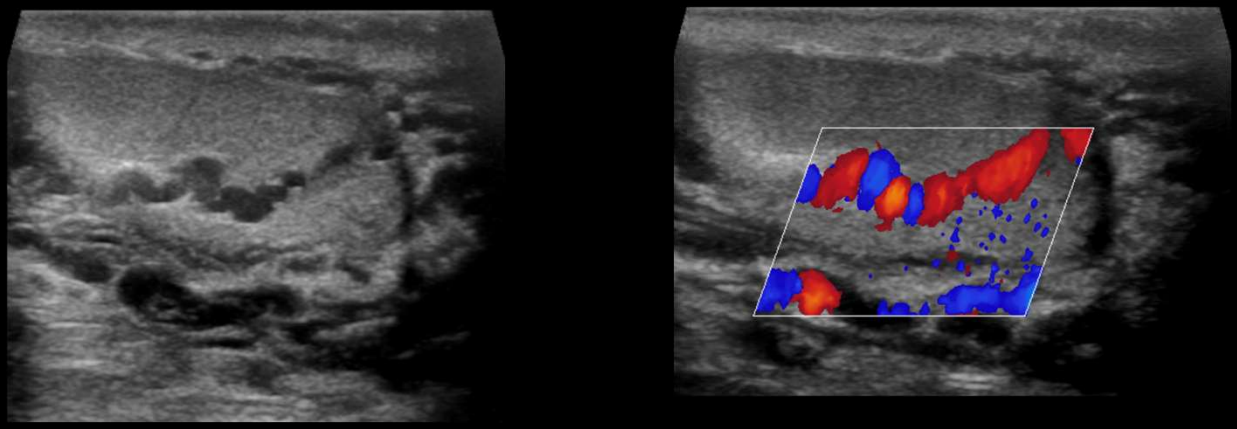
Intratesticular Varices



Radiopaedia.org. (2026). Radiopaedia. https://radiopaedia.org/cases/intratesticular-varicocele-1#image-5731807=

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Varicocele grading recap

- Grade I
  - No dilated intrascrotal veins
  - Reflux in the spermatic cord veins of the inguinal region during Valsalva
- Grade II
  - Dilated supra-testicular veins
  - Reflux at upper pole veins during Valsalva
- Grade III
  - No major dilatation in supine position
  - Dilated veins up to lower pole of testis seen only while standing
  - Peritesticular reflux in enlarged veins during Valsalva maneuver
- Grade IV
  - Dilated veins in suping and standing positions that increase in caliber during Valsalva
  - Reflux at rest, increasing during Valsalva
  - Testicular hypotrophy may be present
- Grade V
  - Dilated veins in supine and standing positions, THAT DO NOT increase in caliber during Valsalva
  - Reflux at rest, not increasing during Valsalva
  - Testicular hypotrophy is common
  - Intratesticular varices may be present

Radiopaedia.org. (2026). Radiopaedia. https://radiopaedia.org/articles/sarteschi-classification-of-varicoceles?lang=us

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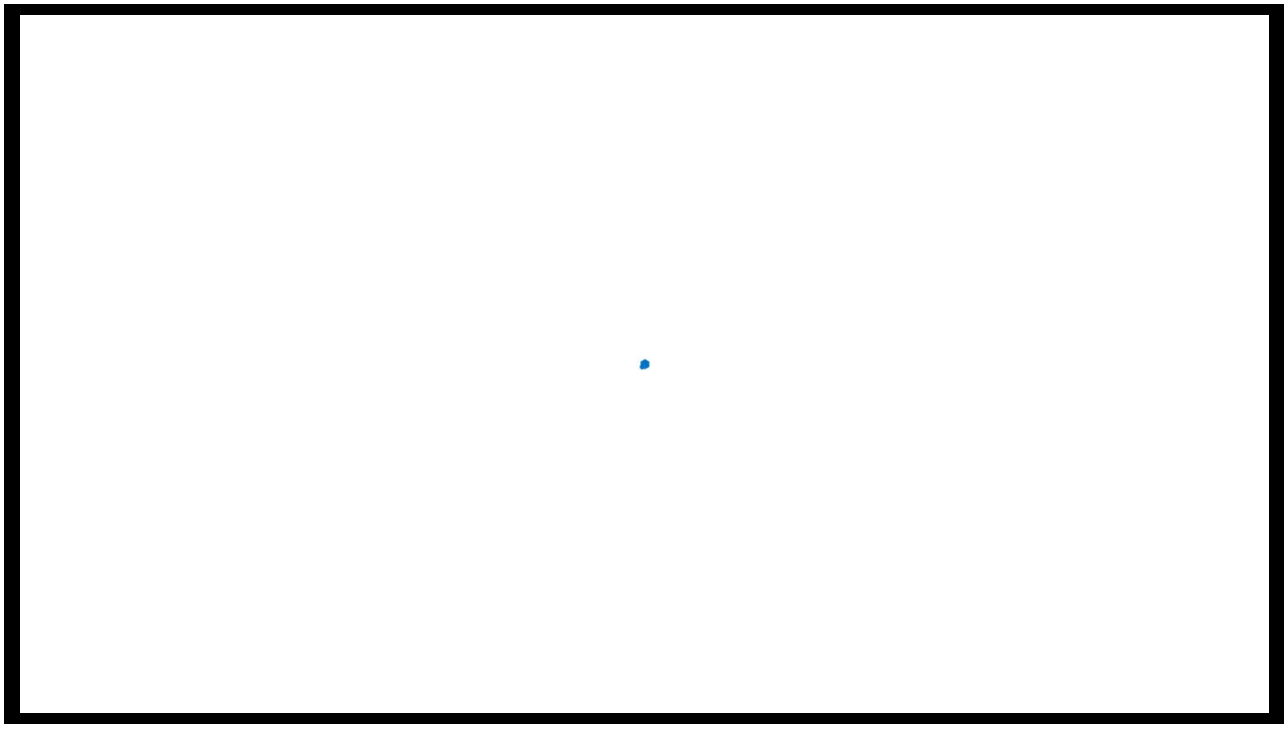

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How are Varicoceles diagnosed?

- Physical exam
  - Supine & Standing
- Scrotal ultrasound
- Semen analysis
- Blood test

- Presence of dilated veins with a diameter of > 3.0mm
  - Reversal of flow after Valsalva maneuver

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Pathophysiology

- Complex and multifactorial
- Age-dependent
  - Pre-pubertal boys-extremely rare
  - Adolescents-up to 15%
- Genetic factors and toxins
- Impaired Leydig cell function

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Pathophysiology

- Most are left sided
  - Hydrostatic pressure in left venous system → higher
  - On the right, tapering configuration may protect against venous reflux
- Missing or defective venous valves
- Nutcracker Syndrome

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002 25

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Pathophysiology

- Histological studies of testicular biopsies
- Bilateral testicular biopsies from 30 infertile varicocele patients
  - Taken during varicocelectomies and post-operatively
- Pre-op biopsies:
  - Reduced spermatogenesis with maturation arrest
  - Dead spermatic epithelium
  - Increase in volume of Leydig cells

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002 26

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Pathophysiology

- Post-Op
- In 22 patients:
  - Spermatogenesis improved
  - Regeneration of the epithelium
- In 18 patients:
  - Quantity of Leydig cells was normalized

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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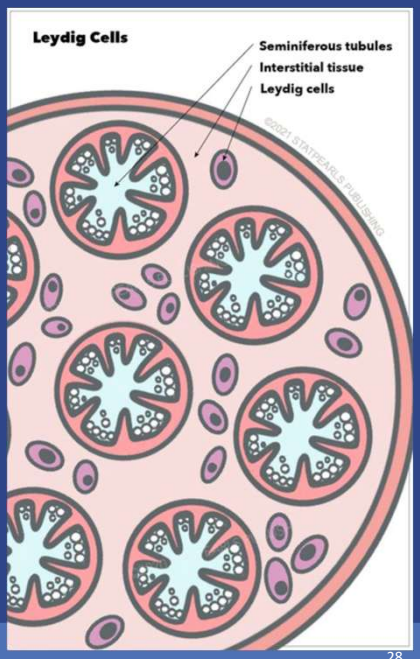
Leydig Cells

- AKA testicular interstitial cells
- Located between seminiferous tubules
  - Contain Sertoli and germ cells
- Can form groups of up to 10 cells
- Polygonal cells
- Abundant lipid content



Aladamat, N., & Tadi, P. (2022, November 14). *Histology, Leydig Cells*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK556007/

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Leydig Cells

- Primary source of testosterone in males
- Crucial role in:
  - Sperm production
  - Controlling sexual development
  - Maintaining secondary sexual characteristics and behavior
- Androgen production occurs inside Leydig cells

Aladamat, N., & Tadi, P. (2022, November 14). *Histology, Leydig Cells*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK556007/

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Effects of varicoceles on sperm

- Poor testicular health
  - Hormone production
  - Testicle growth may be inhibited
  - Gradual shrinkage due to tissue loss
- Infertility
  - 10-20% will experience infertility
  - Fertility issues present, 40% have a varicocele

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Effects of varicoceles on sperm

- Mechanism of altered or impaired testicular blood flow
- Increased scrotal temperature
- Oxidative stress
- Other possible causal factors:
  - Resulting sex hormone changes
  - Reflux of adrenal hormones
  - Autoimmunity

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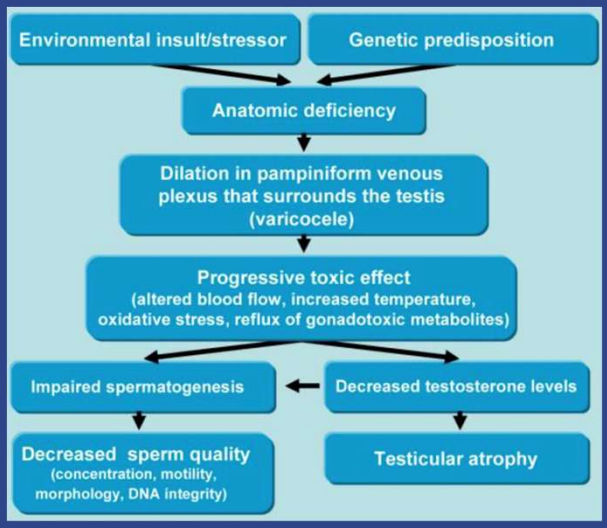
Effects of varicoceles on sperm



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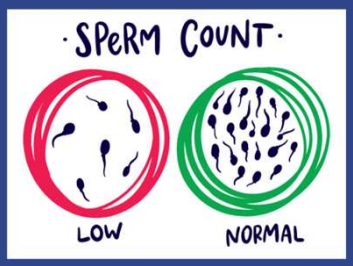
Effects of varicoceles on sperm

- Why do only some patients become infertile?
- Other temperature increasing factors are required before sperm quality is significantly reduced
  - Sleeping posture
  - Sedentary posture & duration
  - Exposure to high temperatures



microptic. (2018, October 18). *Declining sperm count*. HT CASA. https://www.micropticsl.com/declining-sperm-blog/

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Effects of varicoceles on the testis

- Testis function optimally 3 degrees below body temperature
- Increased venous reflux due to varicocele can lead to increased testicular temperature
- The warmer blood can affect:
  - Sperm production
  - Testosterone
- Men with varicoceles AND reduced sperm quality
  - Significantly higher scrotal temperatures

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Negative impact of varicoceles

- Increased production of reactive oxygen species (ROS)
- ↑ ROS ↓ Sperm quality

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What is ROS?

- Reactive oxygen species
- Oxidative stress



- Reduced sperm function
  - Oxidation of fatty acids in spermatozoa membranes
  - Direct DNA damage → increased sperm DNA fragmentation

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Varicocele repair techniques

- Both operative and non-operative approaches
- Percutaneous radiological technique
  - Embolization
  - Sclerotherapy
- Open surgical (varicocelectomy)
  - Inguinal
  - Subinguinal
  - Retroperitoneal
- Laparoscopic
- Microscopic

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Varicocele repair techniques Unilateral or Bilateral Repair

- Unilateral or Bilateral
  - Left side more common
  - Swelling can occur on right side
  - Individually or in unison
- Bilateral varicocele
  - More detrimental than unilateral defect
- 91 men
  - Moderate to large left varicocele
  - Small (grade 1) right varicocele
- Significant improvements in motile sperm
  - Bilateral repair

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Varicocele repair techniques Non-microsurgical

- Palomo (1948)
  - Classic retroperitoneal high ligation
  - Ligating internal spermatic vein
  - Preserves internal spermatic artery
- One of the first techniques developed
  - High rates of recurrence
  - Post-op hydrocele
- Two modifications
  - Inguinal approach
  - Subinguinal approach

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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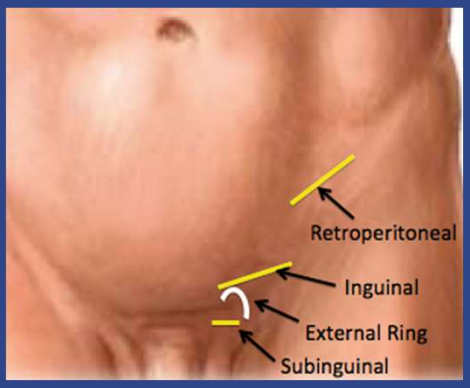
Varicocele repair techniques Non-microsurgical

- Inguinal and Subinguinal approach
  - Incision at or above the external inguinal ring
- Subinguinal
  - Preserves muscle layers
  - Inguinal canal
  - More technically challenging



Coward R, Lomboy J. The Varicocele: Clinical Presentation, Evaluation, and Surgical Management. *Seminars in Interventional Radiology*. 2016;33(03):163-169. doi:10.1055/s-0036-1586143

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Varicocele repair techniques Radiointerventional

- Occlusion procedures
  - Embolization
  - Sclerotherapy
- Less invasive
  - Potential for failure
  - Higher recurrence rates
- Useful in recurrent varicoceles
  - Anatomy may be better delineated

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Varicocele repair techniques Microsurgical

- Preferred approach by most urologists
- Significant reductions
  - Recurrence rates
  - Post-op complications
- Operating microscope
  - Inguinal approach
  - Subinguinal approach
- More reliable identification and preservation of:
  - Testicular artery/arteries
  - Cremasteric artery/arteries
  - Lymphatic channels

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Varicocele repair techniques Complications

- Hydrocele formation
  - Incidence rates higher with nonsurgical approach
  - Secondary to the ligation of lymphatic channels
- Microsurgical and Radiointerventional techniques
  - Drastically reduced, almost eliminated

Hydrocele care & treatment | urologic surgery of NWI. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/. October 22, 2024. Accessed September 3, 2026. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/ [43]

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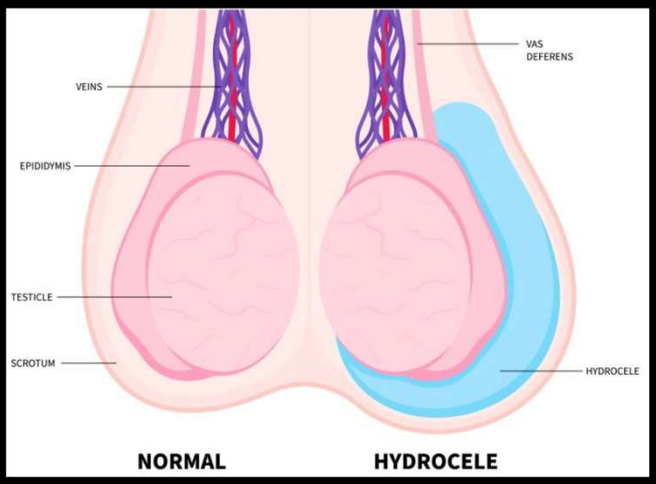
Varicocele repair techniques Complications-Hydrocele



Hydrocele care & treatment | urologic surgery of NWI. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/. October 22, 2024. Accessed September 3, 2026. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/ [44]

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Varicocele repair techniques Complications

- Recurrences
  - Most variable complication
- Testicular artery ligation/injury
  - Common complication of non-microsurgical varicocelectomy
  - True incidence is unknown

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Varicocele Repair and Effect on Semen Analysis Profile

- Varicoceles can induce a stress pattern
- Abnormalities of:
  - Sperm concentration
  - Motility
  - Morphology

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Asthenospermia

- Sperm defect
- Low sperm motility
- Can be caused by:
  - Genital tract infections
  - Pyospermia
  - Antisperm antibodies
  - Structural defects
  - Ejaculatory duct obstruction
  - Varicoceles

Asthenospermia - an overview | ScienceDirect Topics. (n.d.). Www.Sciencedirect.Com. Retrieved July 7, 2026, from https://www.sciencedirect.com/topics/medicine-and-dentistry/asthenospermia

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Asthenospermia

- Varicocele-associated asthenospermia
- Retrospective review
- 118 infertile men
  - 69 infertile men opted for repair
  - 49 infertile men declined repair
- Total motile sperm count increased
  - 30 million/ejaculate → 39 million
  - Spontaneous pregnancy
    - 65% compared to 32%

Asthenospermia - an overview | ScienceDirect Topics. (n.d.). Www.Sciencedirect.Com. Retrieved July 7, 2026, from https://www.sciencedirect.com/topics/medicine-and-dentistry/asthenospermia

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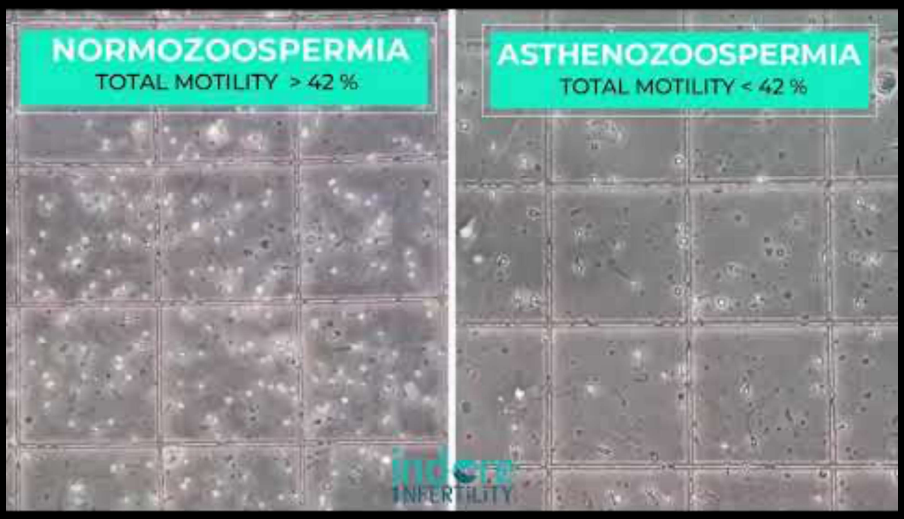
Asthenospermia



Indore Infertilty Clinic. *Asthenozoospermia | Sperms with Low Motility | Side by Side Comparison Normal Vs Asthenozoospermia*. YouTube; 2020. Accessed September 3, 2026. https://www.youtube.com/watch?v=KNybA2YdDd0

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Teratozoospermia

- Abnormal sperm morphology
- Causes can include:
  - Genetics
  - Diabetes
  - Vasectomy reversals
  - Injuries
  - Smoking
  - Malnutrition
  - Drug/Alcohol abuse
  - Cancer treatments
  - Age

What is Teratozoospermia? RMA Network - Fertility Clinic. August 18, 2020. Accessed September 3, 2026. https://rmanetwork.com/blog/what-is-teratozoospermia/

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Teratozoospermia



Poor Sperm Morphology. Private IVF Wandsworth | Concept Fertility. Accessed September 3, 2026. https://www.conceptfertility.co.uk/fertility-testing-info/causes-of-male-infertility/poor-sperm-morphology/

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Oligozoospermia

- Low sperm count
- Most common anomaly
- Categorized by:
  - Mild: 10-16 million/mL
  - Moderate: 5-10 million/mL
  - Severe: Less than 5 million/mL

Low-Sperm-Count-Oligozoospermia. Malereproduction.Org. Accessed September 3, 2026. https://Www.Malereproduction.Org/Low-Sperm-Count-Oligozoospermia/

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Oligozoospermia

- Causes:
  - Varicocele
  - Poor hormone balance
  - Infections
  - Smoking, drinking, drug use
  - Being overweight
  - Stress

Low-Sperm-Count-Oligozoospermia. Malereproduction.Org. Accessed September 3, 2026. https://Www.Malereproduction.Org/Low-Sperm-Count-Oligozoospermia/

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Oligozoospermia

- Multitude of studies
- 16 studies
  - 1077 treated patients
- 12 of the 16 studies
  - Significant improvements in sperm concentration post-op

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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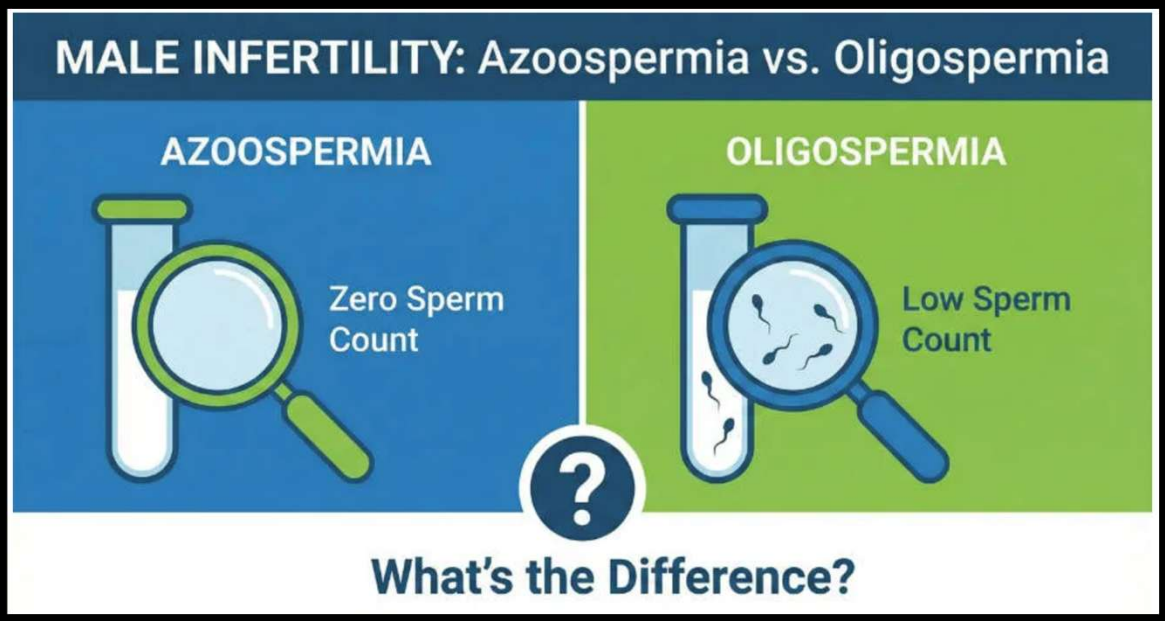
Oligozoospermia

- Low sperm counts in less severe range ⬆ Greater post-op improvements
- Severe oligozoospermia ➡ less likely to see improvements in semen

- Severe oligozoospermia
  - Pre-op sperm count
  - Post-op pregnancy rates
- Lower chance of spontaneous pregnancy
  - 8% compared to 61%
  - Those with greater than 5 million/mL

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002 55



Azoospermia vs. Oligospermia – What's the Difference? CIFAR IVF - Center For Infertility & Assisted Reproduction. December 8, 2025. Accessed September 3, 2026. https://www.cifarivf.com/azoospermia-vs-oligospermia-whats-the-difference/ 56

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Factor	Azoospermia	Oligospermia
Sperm Count	Zero sperm in semen	Low sperm count (<16 million/mL)
Type	Obstructive or Non-obstructive	Mild, Moderate, or Severe
Cause	Blockages, testicular failure, genetic or hormonal issues	Hormonal imbalance, varicocele, lifestyle, infections
Diagnosis	Semen analysis, hormonal tests, ultrasound, biopsy	Semen analysis, hormone tests, scrotal ultrasound
Treatment	Surgery, hormonal therapy, assisted reproduction (IVF, ICSI with sperm retrieval)	Medications, lifestyle changes, varicocele repair, ART
Chance of Biological Fatherhood	Possible with advanced sperm retrieval techniques	Higher likelihood, especially in mild to moderate cases

Azoospermia vs. Oligospermia – What's the Difference? CIFAR IVF - Center For Infertility & Assisted Reproduction. December 8, 2025. Accessed September 3, 2026. https://www.cifarivf.com/azoospermia-vs-oligospermia-whats-the-difference/[57]

Severe Oligozoospermia/Nonobstructive Azoospermia

- Complete absence of sperm in the sample
- Affects 1% of all men
- Affects 10-15% of infertile men
- Significantly reduces chances of spontaneous pregnancy

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002[58]

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Severe Oligozoospermia/Nonobstructive Azoospermia

- Significantly reduce chances of spontaneous pregnancy
- Approximately 4-13% with palpable varicocele
  - Azoospermia
  - Severe oligozoospermia
- After microsurgical varicocelectomy
  - Return of motile sperm post-op
  - 55% of men with azoospermia
  - 69% of men with severe oligozoospermia
  - 31% conceived pregnancies

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Types of Azoospermia

Obstructive Azoospermia

- Sperm production is normal
- Blockage in the reproductive tract
- Prevents sperm from reaching the ejaculate

Causes:

- Vasectomy
- Infection
- Trauma
- Congenital absence of the vas deferens

Azoospermia vs. Oligospermia – What's the Difference? CIFAR IVF - Center For Infertility & Assisted Reproduction. December 8, 2025. Accessed September 3, 2026. https://www.cifarivf.com/azoospermia-vs-oligospermia-whats-the-difference/

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Types of Azoospermia

Non-obstructive Azoospermia

- Sperm production issue
- No sperm in the ejaculate
- Usually have normal ejaculate volume
- Smaller than average sized testicles

Causes:

- Genetic disorders
- Hormonal imbalances
- Testicular failure
- Exposure to toxins
- Previous cancer treatment

Masterson T. What is Non-Obstructive Azoospermia (NOA). ASRM.Org. December 16, 2021. Accessed September 3, 2026. https://connect.asrm.org/smru/blogs/thomas-masterson/2021/12/16/what-is-non-obstructive-azoospermia-noa?ssopc=1

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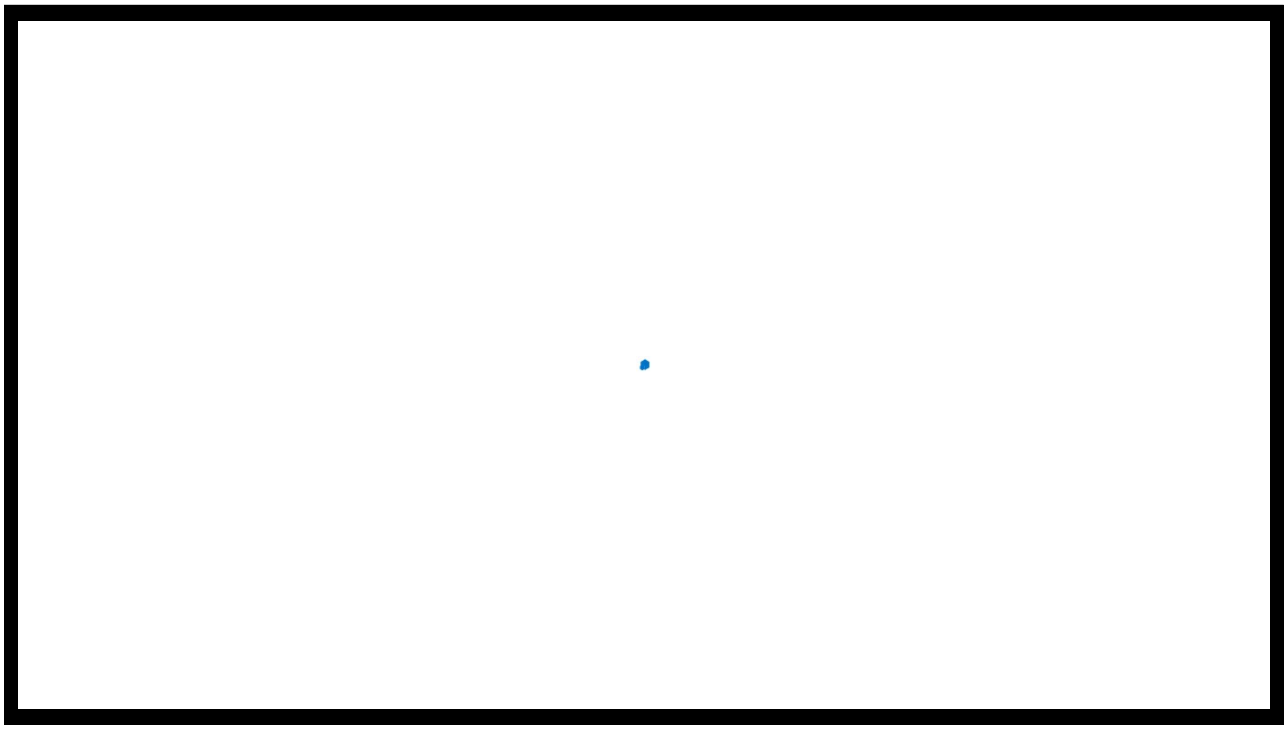

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DNA Fragmentation

- Adolescents with bilateral varicocele
  - Higher levels of DNA fragmentation
- Biomarkers for oxidative stress, found to decrease after varicocele repair
- DNA damage:
  - Increased ROS (reactive oxygen species)
  - Reduced total antioxidant capacity (TAC)

Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.

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Sperm DNA damage

- AKA Sperm DNA fragmentation
- Major cause of defective sperm function
- Oxidative DNA damage:
  - Affects sperm quality
  - Increases risk of genetic and epigenetic abnormalities
- Factors that result in oxidative stress:
  - Poor social habits
  - Infection
  - Psychological stress
  - Sedentary lifestyle

Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.

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Sperm DNA damage

- Who is a good candidate for sperm DNA fragmentation?
  - Recurrent failure in IVF/ICSI cycles
  - Men of advanced age
  - Increased BMI
  - Poor social habits
  - Exposure to endocrine disrupting chemicals
  - Men with clinical grade 2 or 3 varicoceles (who are considered candidates for varicocelectomy)

Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.

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Sperm DNA damage

- Sperm DNA integrity is not a routine parameter measured in standard semen analysis
- Impact of varicocele and treatment on sperm DNA damage is a growing area of interest
- Conflicting results do exist regarding impact of varicocelectomy on restoring two indirect markers of DNA integrity
  - TAC
  - ROS

Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.

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Sperm DNA damage

Conflicting results

- One found no absolute change in semen total antioxidant capacity (TAC) following surgical repair of varicocele
- One showed that varicocelectomy can improve semen TAC and reduce reactive oxygen species (ROS)
- Differences in findings may vary due to variances in grade of varicoceles and surgical approach

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele

- Non-palpable dilation in the internal spermatic vein
- Most commonly observed by scrotal ultrasound

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele

Grade	Description
Grade 0	Seen on ultrasound, but not physically detectable (also called "subclinical varicocele")
Grade I	Palpable (felt on exam) when the patient is performing the valsalva maneuver ("bearing down")
Grade II	Palpable even without valsalva
Grade III	Varicocele causing visible deformity of the scrotum.

Varicocele. (2020). https://www.hopkinsmedicine.org/health/conditions-and-diseases/varicocele

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele vs Clinical Varicocele

- Studies done in the mid 1980's-early 1990's
- Significant improvements in post-op sperm quality
  - Density
  - Motility
  - Morphology
- Similar post-op improved pregnancy rates

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele vs Clinical Varicocele

- Similar post-op improvements
  - Semen parameters
  - Pregnancy rates

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele

- 3 subsequent randomized controlled trials
  - Varicocele repair for subclinical varicoceles showed modest post-op improvements
- 85 infertile men
  - Subclinical varicocele
  - Either high ligation or observation

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele

- Randomized
- 42 infertile men
  - Isolated left subclinical varicocele
  - Either high ligation or Clomiphene
- Improvements in:
  - Sperm density
  - Sperm motility
  - No significant difference in pregnancy rates

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Subclinical Varicocele

- Randomized
- 68 infertile men
  - Abnormal semen analysis
  - Ultrasound detected left varicocele
- High ligation vs. Observation for 12 months
  - Post-op semen analysis and pregnancy rates = no differences

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Abundance of studies have been published
- Large numbers vs adequate control groups
- Does treatment of clinical varicoceles offer improved fertility?

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- First randomized controlled trial in 1979
- 96 men
  - Infertility
  - Visible varicocele
- Randomized
  - Palomo high ligation
  - No treatment
- No differences noted between treatment & control group

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Suboptimal study population
- Pre & post-op semen analyses
  - ”Before” and “After”
  - Post-op month sperm sample obtained

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Prospective study
- 96 infertile men
- Randomized
  - NO treatment
  - Treatment by various methods
    - Surgical
    - Sclerotherapy
    - Embolization
- No significant differences in semen parameters or pregnancy rates

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Randomized
- 65 infertile men
- Sclerotherapy vs No treatment

- No significant differences noted
- Poor recruitment and poor follow-up
  - 34 patients lost to follow-up
  - Assumed no conception occurred

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- **Results of these studies indicate:**
  - No benefit of varicocele repair over expectant management in sub-fertile couples who have NO other abnormal findings in their workup

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Case-control study
- 224 sub-fertile men
  - 141 men
    - Repair via Palomo technique
  - 83 men
    - No treatment
- Followed for 12 months
  - Semen analyses
  - Monitored for incidence of pregnancy post-op for 2 years

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Significant semen improvements include:
  - Sperm density
  - Percentage of progressive motile sperm
- Pregnancy rates:
  - Significantly higher in corrected group
    - 30% compared to 18%
  - Majority of pregnancies occurred within the first year after repair

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Crossover study
  - Infertile men
  - Visible or palpable left-sided varicocele
  - Oligozoospermia
- Randomized
  - Immediate high ligation (Palomo technique)
  - Observation followed by ligation at 12 months if no pregnancy occured

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- Significant improvements in:
  - Sperm concentration
  - Sperm motility
  - Sperm morphology
- Pregnancy rates:
  - Higher within 12 months after surgery
    - 60% compared to 10%
  - Higher in delayed-treatment group
    - 12 months of obs. vs first 12 months after surgery
    - 44% compared to 10%

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Clinical Varicocele:

- A modern randomized controlled trial focusing on the microsurgical technique in appropriate patients is needed to resolve the controversy over the benefit or lack of benefit of this technique.

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Grade of Clinical Varicocele:

- Which men benefit the MOST from a varicocele repair?
  - Greatest improvements in sperm parameters
  - Improvement in fertility

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Grade of Clinical Varicocele:

- Men with larger varicoceles

- Significantly greater percentage of men with improvements
- Greater absolute improvements in post-op sperm parameters
  - Sperm density
  - Sperm motility

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Grade of Clinical Varicocele:

- Study carried out by the WHO in 1992
- 9038 men
  - Infertility
  - 921-varicocele noted on exam
- Lower sperm concentrations in men with varicoceles of increasing grade

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

- **Grade of Clinical Varicocele:**

- No correlation in post-op improvements based on grading
- Significantly greater improvements in:
  - Total motile sperm counts in those with a clinical varicocele

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Type of Varicocele	Improvements in Semen Parameters			Improvements in spontaneous PR
	Concentration	Motility	Morphology	
Subclinical				
Yamamoto[108]	+	–	–	–
Unal[109]	+	+	–	–
Grasso[110]	+	–	–	–
Clinical				
Nilsson[111]	–	–	–	–
Breznik[112] *	–	–	Not assessed	–
Madgar[86]	+	+	+	+
Nieschlag[116]	+	–	–	–
Krause[113]	–	–	–	–

Summary of postoperative measurements after varicocele repair. Data is limited to statistically significant differences from randomized controlled trials

*Note: Study included subclinical and clinical varicoceles.

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Recurrent Varicocele:

Why are persistent varicoceles seen after attempted repair?

- Numerous collaterals of the internal spermatic vein
  - Retroperitoneal
  - Inguinal
  - Scrotal

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Classifications of Varicoceles & Effect of Repair on Fertility

Recurrent Varicocele:

- Overall low incidence after microsurgical approach
- Subinguinal approach noted good surgical outcomes
- Non-microsurgical technique noted size improvement in 91% undergoing secondary repair
- Addition of microscopy, no recurrences noted in 35/54 patients that completed 6 months follow-up
- Semen parameters improved:
  - Concentration
  - Motility

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Surgical Treatment of Varicocele and Success of Assisted Reproductive Technologies

- Varicocele-associated infertility, persistent infertility
  - ART significantly contributes to treatment
- Sperm processing
  - IUI (Intrauterine insemination)
  - IVF (In vitro fertilization)
  - ICSI (Intracytoplasmic sperm injection
- Alternative to surgery or adjuvant therapy to achieve pregnancy

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Surgical Treatment of Varicocele and Success of Assisted Reproductive Technologies

Intrauterine Insemination:

- Possible treatment option
- 71 couples
- 187 inseminations → 6 pregnancies

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Surgical Treatment of Varicocele and Success of Assisted Reproductive Technologies

Intrauterine Insemination:

- Does varicocele repair improve chance of success with IUI?

- 58 couples
  - Varicocele-associated infertility
  - 34 previously underwent microsurgical repair
  - 24 chose not to undergo repair
- Pregnancy rates per cycle
  - 6.3% untreated group
  - 11.8% surgical repair

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Surgical Treatment of Varicocele and Success of Assisted Reproductive Technologies

IVF & ICSI:

- Can varicocelectomy be correlated with improved fertility?
  - Difficult to assess
- Small observational study
  - Infertile men
  - History of failed fertilization with IVF
- Varicocelectomy could improve fertilization in subsequent IVF cycle

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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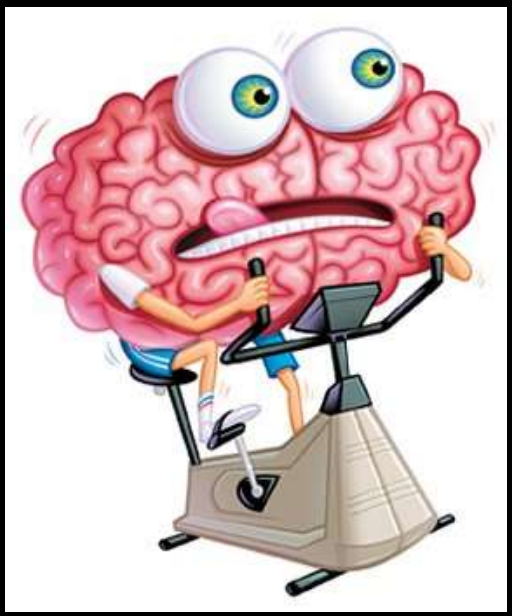

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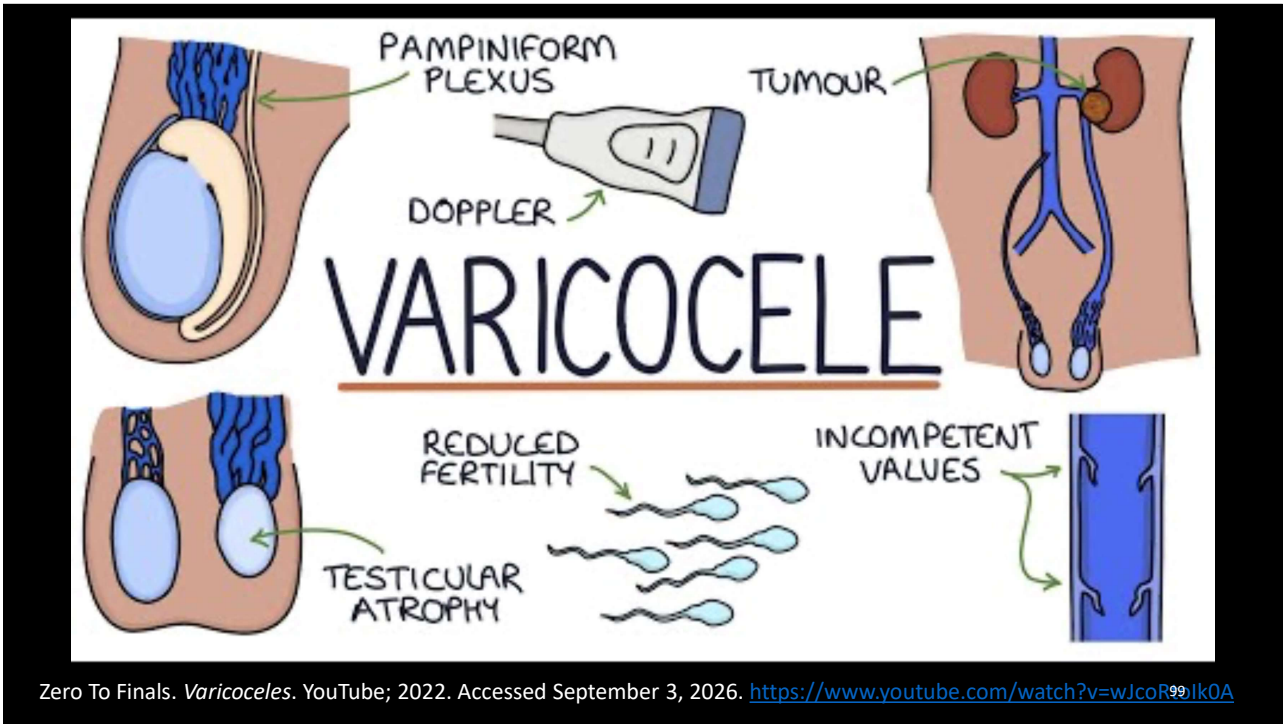

Zero To Finals. *Varicoceles*. YouTube; 2022. Accessed September 3, 2026. https://www.youtube.com/watch?v=wJcoR9olk0A

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Conclusion

- Varicocele repair → Primary treatment option
  - Couple with documented infertility
  - Male with palpable varicocele
  - Suboptimal semen quality
  - Female partner with normal evaluation
- Bilateral repair
  - Varicoceles noted on both sides
  - Regardless of grade

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Conclusion

- Persistent/Recurrent varicoceles
  - Surgical ligation
  - Percutaneous embolization
- Microsurgical approach = Highest rates of success
  Lowest rates of complication

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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Conclusion

- Assisted reproductive technologies (ART)
  - Viable adjunct
  - Alternative to surgery
- Improvements in ART lab technology
  - Delineate benefit of varicocele repair in patients who will require subsequent IVF/ICSI

Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002

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102

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References

- *Asthenospermia - an overview | ScienceDirect Topics*. (n.d.). Www.Sciencedirect.Com. Retrieved July 7, 2026, from https://www.sciencedirect.com/topics/medicine-and-dentistry/asthenospermia
- microptic. (2018, October 18). *Declining sperm count*. HT CASA. https://www.micropticsl.com/declining-sperm-blog/
- Aladamat, N., & Tadi, P. (2022, November 14). *Histology, Leydig Cells*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK556007/
- *Radiopaedia.org*. (2026). Radiopaedia. https://radiopaedia.org/cases/intratesticular-varicocele-1#image-5731807=
- *Radiopaedia.org*. (2026). Radiopaedia. https://radiopaedia.org/cases/intratesticular-varicocele-1#image-5731807=
- Valentino, M., Bertolotto, M., Derchi, L., & Pavlica, P. (2014). Children and adults varicocele: diagnostic issues and therapeutical strategies. *Journal of Ultrasound*, *17*(3), 185–193. https://doi.org/10.1007/s40477-014-0088-3
- *Radiopaedia.org*. (2026). Radiopaedia. https://radiopaedia.org/articles/sarteschi-classification-of-varicoceles?lang=us

References

- Cleveland Clinic. (2023, March 30). *Varicocele: Testicle Pain, Symptoms, Treatments, Male Infertility*. Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/15239-varicocele
- Bertolotto, M., Cantisani, V., Drudi, F. M., & Lotti, F. (2021). Varicocoele. Classification and pitfalls. *Andrology*, *9*(5), 1322–1330. https://doi.org/10.1111/andr.13053
- Alsaikhan, B., Alrabeeah, K., Delouya, G., & Zini, A. (2016). Epidemiology of varicocele. *Asian Journal of Andrology*, *18*(2), 179–181. https://doi.org/10.4103/1008-682X.172640
- *Varicocele*. (2020). https://www.hopkinsmedicine.org/health/conditions-and-diseases/varicocele
- Mayo Clinic. (2017). *Varicocele - Symptoms and causes*. Mayo Clinic. https://www.mayoclinic.org/diseases-conditions/varicocele/symptoms-causes/syc-20378771

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References

- Indore Infertilty Clinic. *Asthenozoospermia | Sperms with Low Motility | Side by Side Comparison Normal Vs Asthenozoospermia*. YouTube; 2020. Accessed September 3, 2026. https://www.youtube.com/watch?v=KNybA2YdDd0
- Poor Sperm Morphology. Private IVF Wandsworth | Concept Fertility. Accessed September 3, 2026. https://www.conceptfertility.co.uk/fertility-testing-info/causes-of-male-infertility/poor-sperm-morphology/
- What is Teratozoospermia? RMA Network - Fertility Clinic. August 18, 2020. Accessed September 3, 2026. https://rmanetwork.com/blog/what-is-teratozoospermia/
- Low-Sperm-Count-Oligozoospermia. Malereproduction.Org. Accessed September 3, 2026. https://Www.Malereproduction.Org/Low-Sperm-Count-Oligozoospermia/
- Azoospermia vs. Oligospermia – What's the Difference? CIFAR IVF - Center For Infertility & Assisted Reproduction. December 8, 2025. Accessed September 3, 2026. https://www.cifarivf.com/azoospermia-vs-oligospermia-whats-the-difference/
- Masterson T. What is Non-Obstructive Azoospermia (NOA). ASRM.Org. December 16, 2021. Accessed September 3, 2026. https://connect.asrm.org/smru/blogs/thomas-masterson/2021/12/16/what-is-non-obstructive-azoospermia-noa?ssopc=1
- Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.

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References

- Coward R, Lomboy J. The Varicocele: Clinical Presentation, Evaluation, and Surgical Management. *Seminars in Interventional Radiology*. 2016;33(03):163-169. doi:10.1055/s-0036-1586143
- Hydrocele care & treatment | urologic surgery of NWI. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/. October 22, 2024. Accessed September 3, 2026. https://urologicsurgerynwi.com/conditions-procedures/hydrocele/
- Dada, R. Sperm DNA Damage Diagnostics: When and Why. *Translational Andrology and Urology* **2017**, *6* (S4), S691–S694. https://doi.org/10.21037/tau.2017.05.26.
- Will MA, Swain J, Fode M, Sonksen J, Christman GM, Ohl D. The great debate: varicocele treatment and impact on fertility. *Fertil Steril*. 2011;95(3):841-852. doi:10.1016/j.fertnstert.2011.01.002
- Zero To Finals. *Varicoceles*. YouTube; 2022. Accessed September 3, 2026. https://www.youtube.com/watch?v=wJcoRtoIk0A

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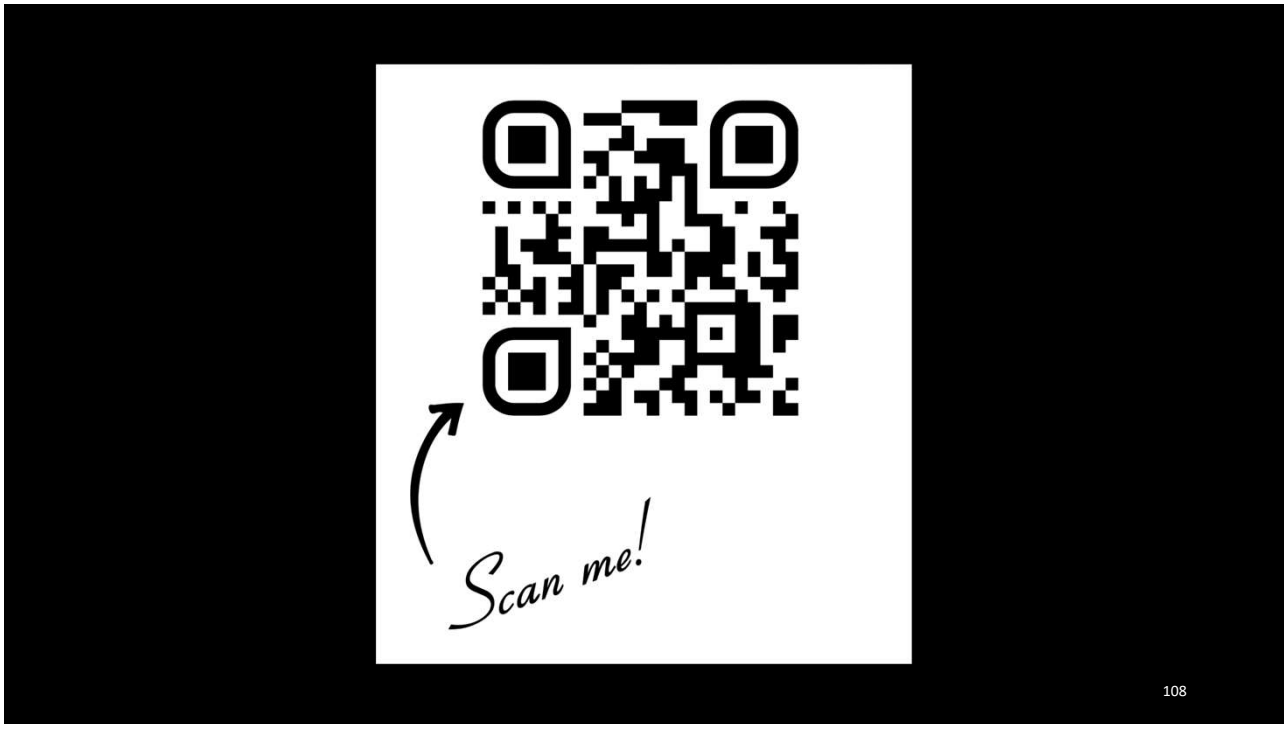

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