Pathophysiology and Treatment of Varicocele

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Overview

- Fast facts
- Pathophysiology
- Indications for treatment
- Varicoceles in adolescents
- Treatment options
Fast Facts

- Most common and correctable cause of male infertility

- 40% of males with 1º infertility, half have improved sperm parameter with varicocelectomy

- 80% with 2º infertility- ? Progression over time

- Incidence are 25% and 12% in men with abnormal and normal semen respectively

- 15% of all males; >80% are not associated with infertility
Pathophysiology

Three questions:

- What causes varicoceles to develop?
- How does varicoceles affect testicular function?
- What effects does varicoceles have on fertility?
Causes of varicoceles
Varicocele Development

- Anatomic/ embryologic- Braedel’s ontogenic basis
- Valves
- Nutcracker phenomenon
Anatomic/ embryologic

- Poor drainage of left spermatic vein into the left renal vein

- Collaterals open during embryogenesis; explains occurrence post sclerosis/ surgery

- Right sided varicoceles associated with into right renal vein; 0.02% of renal cancers
Valves

- Incompetent valves cause varicoceles

- However 26.2% of varicoceles still had competent valves

- Likely a contributary factor
Nutcracker phenomenon

- Compression of testicular venous drainage
- Coolsaet proposed the proximal/ classical form and the distal form
- Refuted- only 0.7% and 0.2% incidences respectively
Effects of varicocele on testicular function
Hyperthermia

- Most widely accepted hypothesis and supported by experiments
- Varicoceles affect the normal countercurrent mechanism
- Heat induces germ cell apoptosis
Renal and adrenal metabolites

- Metabolite reflux as a mechanism
- Animal studies of left sided varicoceles have failed to demonstrate reflux
- Adrenomedullin, a potent vasodilator is elevated in the spermatic vein of varicoceles
Hypoxia

- Hypothesis that elevated venous pressure leads to hypoxia

- Supported by fact that physical activity worsens infertility

- ↑ peritubular fibrosis and hyalinization

- Refuted by blood gas analysis
Others

- Antioxidants
- Gonadotoxins
- Immunological basis
- Apoptosis
- Enzymatic function
Effects of varicocele on fertility
Semen analysis

- Tulloch (1955): Correction of varicocele in an azoospermic patient resulted in fertility

- MacLeod (1965): decreased motility (90%), sperm concentration < $20 \times 10^6$ (65%) & ‘stress pattern’ of morphologic changes i.e. immature spermatids

- So far, no specific patterns identified
Endocrine function

- Leydig cell
  - Variable reports on serum testosterone
  - No studies on intratesticular testosterone
  - Surgery corrects the levels to normal
- Sertoli cell
- Inhibin
- Tranferrin
Current views regarding varicocele-fertility

- Comhaire (2004): Meta-analysis of RCTs found varicocelectomy does not increase pregnancy rates in infertile couples

- Krause (2002), Dohle (2003): Two-fold increase in natural conception in treated men with severe oligospermia

- EAU (2004): Evidence ‘support’ idea that varicocele maybe a cause of infertility
Indications for treatment

- Male factor infertility with adequate maternal potential (>1 year)
- Adolescents - large lesions with testicular hypotrophy
- Adolescents/ adults - associated with pain
- ? Male infertility with azoospermia
The adolescent varicocele: To treat or not to treat?

- Prevalence markedly increases from prepuberty to late teens (15%)

- Controversial issue- no justification YET for prophylactic surgery

- Follow-up with testicular volume .

- Bong (2004): Semen analysis may aid decision-making
The subclinical varicocele

- Definition: not palpable with Valsalva maneuver and only detectable by imaging techniques


- Size of varicocele influences outcome
Surgical approaches

- Palomo (retroperitoneal)
- Ivanessivitch (inguinal)
- Subinguinal
- Laparoscopic

To date, no RCT done to compare the various approaches and decide the best one.
Palomo (retroperitoneal) approach
Palomo Approach

Pros:
1. Simple and quick
2. Modified approach spares testicular artery

Cons:
1. High recurrence rate
2. Postoperative pain
Ivanessivitch (inguinal) approach
Ivanessivitch (inguinal) approach

Pros:
1. Lower recurrence rates
2. Preservation of testicular artery and lymphatics (using microsurgery)

Cons:
1. Postoperative pain
Subinguinal approach

Pros:
1. Low recurrence rates
2. Hydrocele formation is rare
3. Less postoperative pain

Cons:
1. Need for optical microsurgery
Laparoscopic approach

Essentially, a ‘retroperitoneal approach done through the intraperitoneal route’

Cons:
1. Needs laparoscopic equipment
Nonoperative approach

- Transvenous varicocele ablation
- Reserved for surgical failures

Pros: quicker recovery, less pain

Cons: radiation exposure, needs expertise
Summary

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<tr>
<th>Technique</th>
<th>Artery preserved</th>
<th>Hydrocele(%)</th>
<th>Failure (%)</th>
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<tr>
<td>Retroperitoneal</td>
<td>No</td>
<td>7</td>
<td>15-25</td>
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<tr>
<td>Conventional inguinal</td>
<td>No</td>
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<td>5-15</td>
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<td>Laparoscopic</td>
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<td>5-15</td>
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<td>Microscopic inguinal</td>
<td>Yes</td>
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Conclusions

- Current evidence ‘support’ varicocele as a cause of infertility
- Varicocele repair improves semen parameters
- Adolescent varicocele needs monitoring. Surgery only if indicated
- Microscopic repair gives the best results with least morbidity
Thank You