VALVE BLADDER

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POST VALVE ABLATION

No improvement:

- Pre renal cause- post obstructive diuresis
- Renal dysplasia
- Sepsis and infection
- Post renal cause:
  - Hydronephrosis-vesico ureteric obstruction (anatomic or functional)
  - Severe reflux
  - Valve bladder
  - Residual posterior urethral valve
VALVE BLADDER

Posterior urethral valve affect no organ more consistently and more profoundly than the bladder.

Degree of damage varies considerably

Most patients suffer significant life long bladder dysfunction.
VALVE BLADDER

- Two long term problems
- Upper tract drainage affected
- Incontinence
- 50% will reach ESRF in their lifetime
  - Need dialysis or transplantation during first 2 decades of life.
- Abnormal bladder will be a threat to the success of transplantation
Upper Tract Damage

Can occur at
- Newborn stage
- Later childhood

Newborn: Hypercontractile bladder
- Bladder thickened and trabeculated
- Contracts with great force
- Compliance low
- Situation may persist for months even after successful valve ablation.
Upper Tract Damage

Later childhood- Rigid Bladder
- Contraction is less
- Poor compliance
- Poor sensation
DEFINITION
Mitchell 1982

- Chronic condition
- Successful valve ablation
- Bladder dysfunction
- Deterioration of upper urinary tracts
- Urinary incontinence
PATHOPHYSIOLOGY

Mitchell 1982

- Poor bladder sensation
- High bladder volumes
- Poor compliance
- High storage pressures
- Poor drainage of upper tracts
Comfortable with large bladder volumes at high pressure
Overflow incontinence
Void infrequently and incompletely
Full Valve Bladder Syndrome
Duckett & Snow 1986

- Upper tract dilatation progresses despite adequate valve ablation
- Sensation of bladder decrease
- Increase intra vesical pressure occur at low filling volume
- VUJ obstructs with bladder filling- no more urine enters bladder
- Upper tract fills with inherent dilatation
- After voiding, bladder fills up rapidly with drainage form upper tracts
- Worsened by polyuria
Full Valve Bladder Syndrome
Duckett & Snow 1986

- Urodynamics:
  - Poor compliance
  - Delayed sensation of fullness

- Treatment:
  - Double/ triple voiding
  - CIC
  - Anti cholinergics
  - Bladder augmentation
Induced condition. Combination of:
- Polyuria
- Impaired bladder sensation
- Residual urine

Bladder decompensation
- Increased residual urine
- Upper tract dilation
- Renal injury
PATHOPHYSIOLOGY
Koff et al 2002

- Hydronephrosis - persistent or progressive
- Bladder overdistention:
  - Polyuria (24 urine volume > 2 liter (10/18)
  - Impaired bladder sensation (18/18)
  - Residual urine (14/18)
Detrusor Dysfunction

- Smooth muscle infiltrated with increased amount of Type III collagen and elastin
  - Cause loss of compliance
  - Small capacity bladder
  - High pressure bladder

- Changes in neurotransmitter receptor concentration in obstructed bladder
  - Hyperreflexia (Elbadawi 1989)
Valve Bladder

- Is it a permanent disability?
- Can the valve bladder improve?
- Can renal deterioration be prevented?
- Can bladder dysfunction normalize?
EVALUATION

- Voided volume chart
- Ultrasound - assess degree of hydronephrosis
- Videourodynamicss:
  - Ability of bladder to hold and empty adequate volume at acceptable pressures
- Lasix renography: relative renal function and drainage
- Whitaker perfusion test – measure intrarenal pressures at a given drainage rate
Diuretic Renogram
DTPA / MAG3
URODYNAMICS
WHITAKER TEST
DIAGNOSIS
Ghanem et al 2004

- Video urodyamics
- Correlation between abnormal urodyamics (poor compliance and detrusor overactivity) with poor renal function.
Urodynamics in Children

- **Technique**
  - Supra pubic
  - Double lumen- one for infusion and one for bladder pressure monitoring
  - Rectal line

- **Indication:**
  - Deterioration of renal function in spite of adequate valve ablation
  - In children > 6 years and still incontinent
URODYNAMICS – 3 PATTERNS
(Peters 1990)

- Myogenic failure
- Detrusor hyperreflexia
- Decreased compliance/ small capacity
URODYNAMICS
(Holmdahl 1996)

- Dominant pattern changed with age
- Stages of development
- Infants - poor compliance
- Older children - instability from hypercontractility
- Post pubertal boys - myogenic failure
First 3 years of life:
- Vanishing hypercontractility and increasing bladder capacity, even though instability remain unchanged

4 – 12 years
- Decreasing instability and hypercontractility
- Major problem- emptying difficulties
Voiding patterns during day and night

- 10 incontinent and 6 continent boys with PUV
- Small frequent voiding during the day with fewer or no voidings during night. High bladder volumes in morning
- Bladder unstable during day and stable at night
- Voiding detrusor pressure was higher and functional bladder capacity lower during the day than at night
URODYNAMICS

- Need regular urodynamic
- Track changes in pattern
- Alter management
- First 2 decades of life
AIMS OF TREATMENT

- Preserve renal function
- Achieve a Functional bladder
  - Storage
  - Continence
RENAL INJURY

Glomerular insults
- Renal dysplasia- irreversible
  - Affect renal growth and development
- Obstructive uropathy
  - Produce ongoing injury
  - Reversible
- Infections:
  - Reflux
  - Incomplete bladder emptying
MANAGEMENT
Austin et al 1999

- Aim to lower bladder pressure and promote bladder emptying:
  - Timed voiding
  - α blockers
  - Clean intermittent catheterisation
MYOGENIC FAILURE

- Older children
- Overflow incontinence
- Incomplete bladder emptying
  - Ensure that there is no residual obstruction
  - Not due to bladder neck hypertrophy

Treatment:
- Timed voiding
- Double voiding/ Triple voiding
- $\alpha$ blockers
- CIC
Detrusor Hyperreflexia

- Adequate emptying
- Urine frequency
- Urine incontinence

Treatment:
- Anti cholinergics
POORLY COMPLIANT BLADDER

Treatment:

- Anti-cholinergics
- Augmentation cystoplasty
Clean Intermittent Catheterisation

- Is it effective?
- What time of regimen?
  - Day time only
  - Day time and night time
Koff et al 2002

- Not a permanent prenatal alteration in bladder anatomy and function
- Sustained postnatal bladder over distention - polyuria, impaired bladder sensation and residual urine volume
- Prevent bladder normalization after valve ablation
- Bladder decompensation - upper tract dilatation and renal injury
Koff et al 2002- 18 boys for 11 yr

- Treat overdistension
  - Daytime alone unsuccessful. Leaves the bladder full throughout the night
  - Nocturnal bladder emptying – indwelling night time catheter, intermittent nocturnal catheterization +/- frequent nocturnal double voiding

- Once nocturnal bladder emptying was started, hydronephrosis markedly improved (comparable to urinary diversion)
MANAGEMENT

Holmdahl et al 2003:
- 35 boys with valve
- Intermittent Catheterization
  - Improve GFR
  - Improve bladder compliance and capacity
INCONTINENCE

- 81% delayed day and night continence at 5 years (Smith et al 1996)
- Only 53% dry at 12 years (Churchill et al 1990)
- Improves by 20 years
- Psychological impact during adolescence (Parkhouse 1988)
INCONTINENCE- CAUSE

- Sphincter injuries
- Bladder neck dysfunction
- Multifactorial – functional ability exceeded
  - Poor bladder sensation
  - Poor bladder compliance
  - Detrusor instability
  - Polyuria – renal tubular damage (several litres/day)
HYDRONEPHROSIS

- Almost all have severe hydronephrosis at diagnosis (96.5% - Scott 1985)
- Resolve after relieve of bladder outlet obstruction
- May or may not be associated with VUR
- Non refluxing hydronephrosis resolves in 49 % after Valve ablation
- 50 % have persistent hydronephrosis for years
- 5-15 years later 25 % still have hydronephrosis (Hulbert & Ducket 1988)
- Only 8 % have obstruction at Whitaker test
HYDRONEPHROTIC UPPER TRACTS – 3 TYPES (Glassberg 1982)

- Drains independent of bladder volume
- Drains only when bladder empty
- Obstructed independent of bladder volume
High Diversion

- Failure to improve after valve ablation
- No improvement in 2 to 3 weeks
  - Vesicostomy
- No improvement after 4 to 6 weeks
  - Higher diversion
VESICOSTOMY

- Small, sick infants
- To small for safe instrumentation
- Preserve renal function
- Somatic growth
- 90% adequate drainage
- 10% inadequate drainage
- ? Loss of bladder volume/capacity
- ? Decrease bladder compliance
UPPER TRACT DIVERSION

- Decompress upper tracts
- Control infection
- Long term results vs valve ablation
  - Krueger et al 1980 Toronto experience
    - Better eventual renal function and somatic growth
  - Reinberg, Duckett & Hendren
    - No significant difference
UPPER TRACT DIVERSION
INDICATIONS

- Fail to respond to bladder level drainage
- Renal function deteriorate
- Recurrent urinary tract infection
- Increasing hydronephrosis
Bladder drainage
- Fall in creatinine by 10% a day to a nadir of < 0.8 mg/dl (70 umol/l)
- Assess creatinine at Day 10
  - < 20 mg/dl (176 umol/l) – continue bladder drainage
  - > 20 mg/dl, and hydronephrosis not improved, consider upper tract diversion

Options of Upper tract diversion
- Loop ureterostomy
- Pyelostomy
- Sober Roux en Y
Ureterocystoplasty
Auto Augmentation

Diagram showing different views of the bladder and related structures.
Seromuscular Enterocystoplasty – Sigmoid colon
THANK YOU