

W21: Voiding Dysfunction after Sling Surgery

Workshop Chair: David Castro-Diaz, Spain

21 October 2014 09:00 - 12:00

Start	End	Topic	Speakers
09:00	09:05	Introduction	<ul style="list-style-type: none"> David Castro-Diaz
09:05	09:20	Postoperative voiding dysfunction. Physiopathology and risk factors	<ul style="list-style-type: none"> David Castro-Diaz
09:20	09:30	Discussion	All
09:30	09:50	Evaluation and diagnosis	<ul style="list-style-type: none"> Tufan Tarcan
09:50	10:00	Discussion	All
10:00	10:20	Treatment and outcomes	<ul style="list-style-type: none"> Christopher Chapple
10:20	10:30	Discussion	All
10:30	11:00	Break	None
11:00	11:50	Case discussion on postoperative voiding dysfunction after sling surgery.	All
11:50	12:00	Concluding remarks	<ul style="list-style-type: none"> David Castro-Diaz

Aims of course/workshop

Sling surgery is the most common procedure performed to treat stress urinary incontinence(SUI) in women. Although most women are cured of incontinence after surgery, a small minority develop voiding dysfunction clinically manifested as significant post-void residual, poor flow rate, urgency and urgency incontinence or pelvic pain which quite often are not easy to deal with. In the absence of clear guidelines, evaluation and management of post-sling voiding dysfunction continues to be controversial particularly in regards to time and choices of therapy.

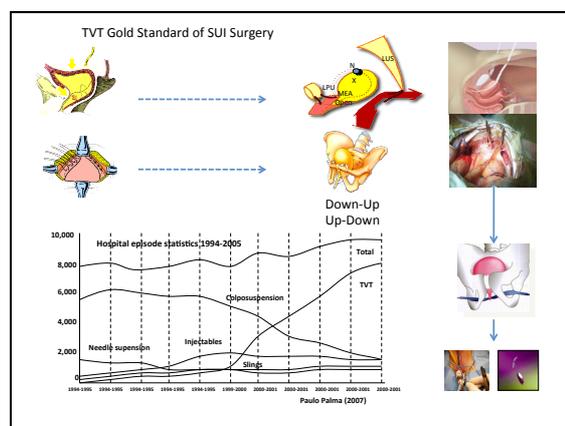
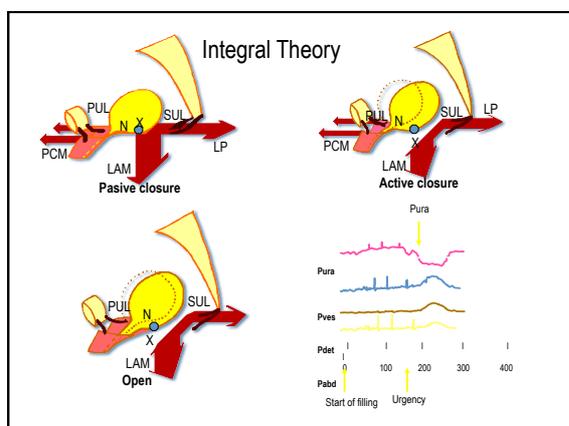
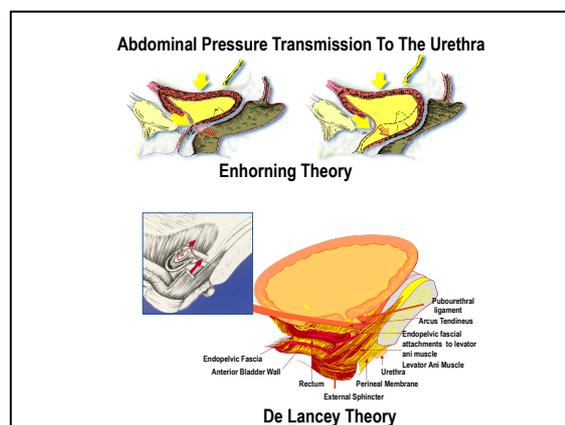
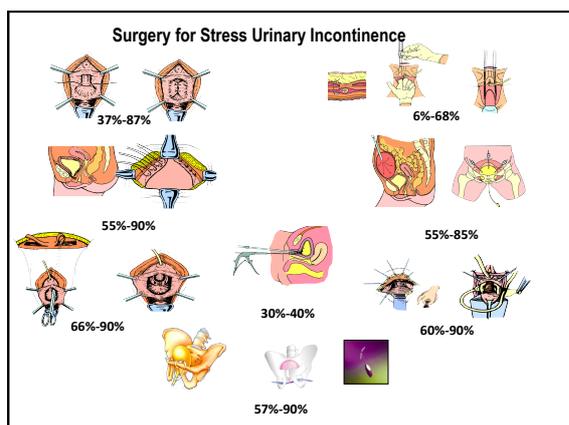
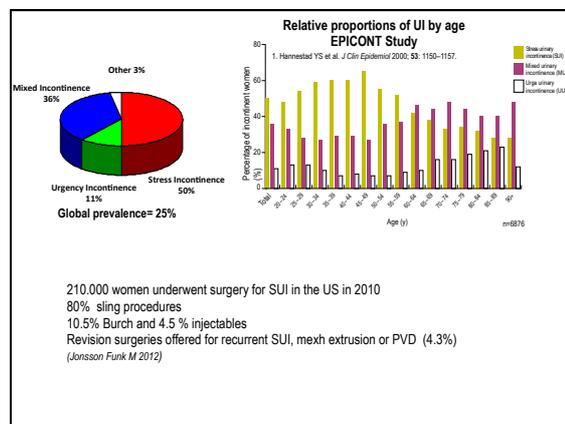
The aim of this workshop is to discuss the different options for the evaluation and management of voiding dysfunction after sling surgery for SUI.

HOSPITAL UNIVERSITARIO DE CANARIAS ULLI Universidad de La Laguna

Postoperative voiding dysfunction (PVD) Physiopathology and risk factors

D. Castro-Diaz

Prof. of Urology, University of La Laguna
Hospital Universitario de Canarias
Spain



Concept of sling surgery

Stress urinary incontinence

Bladder pressure exceeds urethral pressure during sudden increase of intra-abdominal pressure.

Urine leakage may derive from...

- ...loss of backstop support from bladder-neck (= hypermobility of urethra or bladder-neck)
- ...loss of muscular tone at rest (= intrinsic sphincter deficiency / ISD)



Concept of sling surgery

Hypermobility vs ISD

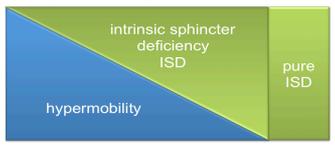
- Coexist in most incontinent women
- All patients with sphincteric incontinence have some degree of ISD
- Definitions controversial
- Use in guiding therapy controversial



- In case of a hypermobile urethra a downward movement should be hampered and firm underground created
- If no hypermobile urethra is present support or even compression should be given

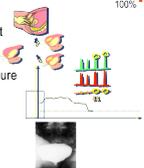
Urethral weakness-Intrinsic Sphincter Dysfunction

TO tape → RP tape → Bulk → AUS



Non Functional Urethra 0% → Functional Urethra 100%

- Bonney-Marshall/TVT Test
- Q-Tip Test
- Valsalva Leak Point Pressure
- Urethral Pressure Profile
- Bladder neck Morphology



Complications of sling surgery

Complication	Frequency
Peri-operative	
• Hemorrhage	0.6 - 2.5 %
• Bladder injury	2.7 - 13.8 %
• Urethral injury	0 - 0.1 %
• Vascular injury (Iliac)	0.1 - 0.6 %
Post-operative	
• Pelvic hematoma	0.7 - 3.4 %
• Urinary retention	2.3 - 19.7 %
• Urinary tract infection	0.7 - 22.3 %
• De novo urgency	0.2 - 15 %
• Vaginal erosion	0.5 - 1.3 %
• Bladder/urethral erosion	0.01 - 0.02 %

Rappoport et al, 2007

Postoperative voiding dysfunction (PVD)

Typically diagnosed when a patient develops de-novo signs or symptoms of LUT dysfunction including but limited to:

- Urinary retention
- High post-void residual
- Poor urinary flow
- Urinary frequency
- Urinary urgency
- Pelvic pain
- Abnormal / spread flow or position depending capability to void

When temporary related to sling surgery → straightforward diagnosis of PVD
 When develop insidiously months or years after → more difficult diagnosis

12% gradual onset > 1 year after (Carr 1997)

SISTER trial 5.8% surgery for retention or de-novo urgency incontinence 18% required treatment 7.5% de-novo detrusor overactivity
 (Albo ME 2007, Kenton K 2009, Elliot CS 2012)

Postoperative voiding dysfunction (PVD)

PVD lasting > 4 weeks

- 3%-7% Burch
- 4%-8% Transvaginal needle suspensions
- 3%-11% Sling procedures (Leach G 1997)

PVD after MUS = 2% - 25%

Kuava N 2002, Deval 2003, Jeffrey L2001, Tamussino KF 2001, Hodroff MA 2005, Abouassaly R, 2004, Debodinance P 2002, Karram MM 2003, Levin I 2004, Meschia M 2001, Moss E 2002, Roumequere T 2005,

- Prolonged necessity of self-catheterization or high residual volume
- May also present with
 - Urgency
 - Recurrent UTI's

• Risk factors not well determined
 • Optimal evaluation & management not defined

Transient causes of postoperative retention

- Pain
- Use of narcotics analgesics
- Patient immobility
- Edema at the operative site
- Retropubic hematoma

May suppress micturition reflex (Wein 2002)

A period of catheterization for several days postoperatively allows resumption of normal voiding in most cases

Backfilling the bladder has been reported as more effective than spontaneous voiding trial (Foster 2007)

Postoperative voiding dysfunction (PVD)

- Precise definition of short/long-term problems not defined
- Short-term retention = 0 % to 27 %, long-term= 0 % to 3.8 %. (Petri 2005)
- Tape too tight or bad contractility
- Cochrane Data base TVT 5.9% TOT 2.8% (Ogah J 2009)
- Diagnosed by hypersuspension
- Swann sign at MCU; curve at bladder neck
- Prolonged voiding with low Qmax<15 cm H2O & Pdet (>25 cm H2O) & PVR
- OAB complaints

Bladder Dysfunction following mid urethral slings

Urinary Retention

References	Procedure	No Pts	% Requiring Catheterization	% Requiring Tape incision	% De Novo Urgency
Abouassaly 2004	TVT	241	19,5	4,15	13,6
Jeffry 2001	TVT	112	8,9	2,7	25,9
Karram 2003	TVT	350	4,9	1,7	Not reported
Levin 2004	TVT	313	2,5	0,3	8,3
Nilsson 2001	TVT	90	0	0	5,9
Rezapour 2001	TVT	80	4,8	1,6	6,4
Andonian 2005	SPARC	41	4,9	4,9	Not reported
Barber 2006	TVT/TOT	213 / 205	1,9 / 1,5	7 / 1,5	8,9 / 2,9
Fisher 2005	TOT	220	5,5	2	0
Delorme 2004	TOT	32	3,1	Not reported	15,6

Adapted from Daneshgari 2008

Bladder Dysfunction following SUI surgery

Short-term voiding difficulties following Burch appear more likely than following TVT (Ward 2002)

Short-term voiding difficulties more common after pubovaginal sling than after TVT (Tsivian 2004)

Transobturator appear to have fewer "obstructive" complications than retropubic MUS (Morey 2006)

Development of De Novo Urge Incontinence in Women Post Sling: The Role of Preoperative Urodynamics in Assessing the Risk - Alperin M Neurourol Urodyn 2007

Parameter	Total number of subjects	Number with postoperative urge urinary incontinence (%)	OR (95% CI)
Preoperative symptoms			
Urgency			
No	49	11 (22.5)	1.0
Yes	43	14 (32.6)	1.7 (0.6, 4.5)
Increased daytime frequency of urination			
No	58	11 (19.0)	1.0
Yes	34	14 (41.2)	3.3 (1.2, 9.3)*
Fecal Incontinence			
No	88	22 (25.0)	1.0
Yes	4	3 (75.0)	6.6 (0.6, 73.2)
Postoperative			
Time to spontaneous post-op void (days)			
1	60	15 (25.0)	1.0
2-6	15	4 (26.7)	0.9 (0.2, 3.4)
>7 (max 8 days)	17	6 (35.3)	1.5 (0.4, 5.0)
Urodynamics			
Maximum cystometric capacity (ml)			
<400	35	10 (28.6)	1.0
400-600	41	12 (29.3)	1.2 (0.4, 3.6)
>600	16	3 (18.8)	0.6 (0.1, 2.7)

Development of De Novo Urge Incontinence in Women Post Sling: The Role of Preoperative Urodynamics in Assessing the Risk - Alperin M Neurourol Urodyn 2007

Parameter	Total number of subjects	Number with postoperative urge urinary incontinence (%)	OR (95% CI)
Volume at first desire to void (ml)			
<150	34	8 (23.5)	1.0
150-250	31	10 (32.3)	1.2 (0.4, 4.0)
>250	27	7 (25.9)	1.0 (0.3, 3.4)
Volume at strong desire to void (ml)			
<300	56	15 (26.8)	1.0
300-400	17	3 (17.7)	0.6 (0.2, 2.8)
>400	19	7 (36.8)	1.4 (0.4, 4.2)
Maximum detrusor pressure (low vs. high) (cm H₂O)			
≤15	76	16 (21.1)	1.0
>15	16	9 (56.3)	4.6 (1.4, 15.0)*
Maximum flow rate (ml/sec)			
<20	51	16 (31.4)	1.0
20-29	22	4 (18.2)	0.6 (0.2, 2.2)
≥30	19	5 (26.3)	0.8 (0.2, 2.8)
MUCP (cm H₂O)			
<20	29	12 (41.4)	1.0
20-40	37	8 (21.6)	0.4 (0.1, 1.3)
>40	26	5 (19.2)	0.4 (0.1, 1.7)

Predicting postoperative voiding dysfunction

Abdominal straining (Gateau 2003)

Absent detrusor contraction & Valsalva voiding patterns (Miller 2003)

Preoperative Low PdetQmax) (Wang 2003, Ghezzi 2006)

SISTER trial: Preoperative Urodynamics did not predict voiding dysfunction necessitating sling take-down (Lemack 2008)

↓
 Impaired emptying symptoms
 Elevated post void residual urine
 Abnormal screening Uroflowmetry } May benefit from preoperative UDS
 (Lemack 2008)

Postoperative voiding dysfunction (PVD)

Risk Factors

- Less likely when using TOT versus Retropubic approach
(Richter HE 2010, Barber MD 2008, Barry c 2008, Schierfritz L 2008)
- Resolution of DOA is greater in patients undergoing TOT MUS vs Retropubic MUS and bladder neck slings : 47% resolution vs 35% and 14% respectively
(Gamble 2008)

Other Risk Factors

- Advance age
- Presence of High postvoid residual volume
- Use of Valsalva effort to void during preoperative urodynamic evaluation
- Previous incontinence surgery
- Previous prolapse surgery
- Q max < 15 ml/s
(Elliot CS 2012)

Take home messages

- PVD after sling surgery is not uncommon
- PVD may debut immediatly or after a while following SUI surgery
- Reported prevalence of PVD ranges from 2% to 25%
- Seems to be lower in TOT Vs Retropubic approach
- Risk factors include: Advance age, high preoperative PVR, use of Valsalva to void in preoperative evaluation, previous either incontinence or POP surgery and a Q max < 15 ml/s

Postoperative voiding dysfunction after incontinence surgery



Christopher Chapple
Patricia Kuo
Sheffield Teaching Hospitals
NHS Foundation Trust
UK




With Thanks to Vic Nitti for slides

Complications of Slings: Post Operative Voiding Dysfunction

Victor W. Nitti MD

Professor of Urology and Obstetrics and Gynecology
Vice Chairman Department of Urology
Director of Female Pelvic Medicine & Reconstructive Surgery
NYU Langone Medical Center



How common is voiding dysfunction?

- AUA SUI clinical guideline panel reports a rate of retention for all stress incontinence procedures at 5-8% 4 weeks postoperatively

Leach GE, Dmochowski RR, Appell RA, et al. Female Stress Urinary Incontinence Clinical Guidelines Panel summary report on surgical management of female stress urinary incontinence. J Urol. 1997; 158:875-880

- Likely under-reported, due to lack of specific diagnostic criteria by which to characterize female BOO

Rosenblum N, Nitti VW: Post-urethral hypersuspension obstruction. Curr Opin Urol 2001, 11:411-416

How common is voiding dysfunction? Autologous bladder neck sling

- Prospective RCT data: SISTEr trial
 - 326 women randomised to have tension free bladder neck sling
 - Of these, 19 (5.8%) underwent surgery for urinary retention or de-novo voiding symptoms

Albo ME, Richter HE, Brubaker L, et al. Burch colposuspension versus fascial sling to reduce urinary stress incontinence. NEJM 2007;356:2143

How common is voiding dysfunction? Synthetic midurethral slings

- Trials comparing transobturator and retropubic approach show similar rates of postoperative retention requiring intervention 0.6-3%

• Barber MD, Kleeman S, Karram MM, et al. TOT compared with TVT for the treatment of stress urinary incontinence: a RCT. Obstet Gynecol. 2008;111:611.
 • Barry C, Lim YN, Muller R, et al. A multi-centre, RCT comparing the retropubic (RP) approach versus the transobturator approach (TO) for tension-free, suburethral sling treatment of urodynamic stress incontinence: the TORP study. Int Urogynecol J Pelvic Floor Dysfunct. 2008;19:171
 • Schierlitz L, Dwyer PL, Rosamilia A, et al. Effectiveness of TVT compared with TOT in women with stress urinary incontinence and intrinsic sphincter deficiency: a RCT. Obstet Gynecol. 2008;112:1253.

How common is voiding dysfunction? Synthetic midurethral slings

- Largest trial (Urinary Incontinence Treatment Network) involving 597 women, had 1.5% having voiding dysfunction requiring surgery or catheterization

Richter HE, Albo ME, Zyczynski HM, et al. Retropubic vs transobturator midurethral slings for stress incontinence. NEJM 2010;362:2066

Criteria for defining voiding dysfunction

- No consensus on the optimal evaluation
- Patients can present with a variety of symptoms
- Yet some patients may be asymptomatic
- Important factor in diagnosis - temporal relationship between surgery and onset of symptoms

• BN Patel, KC Kobashi, D Staskin. Iatrogenic obstruction after sling surgery. *Nat. Rev.Urol.* 2012, 9: 429-434

Criteria for defining voiding dysfunction

- Hence, the most sensible assessment of postoperative voiding dysfunction should relate to the patient's preoperative voiding status

• Rosenblum N, Nitti VW: Post-urethral suspension obstruction. *Curr Opin Urol* 2001, 11:411-416.
 • Gomelsky A, Nitti VW, Dmochowski RR: Management of obstructive voiding dysfunction after incontinence surgery: lessons learned. *Urology* 2003, 62:391-399.

Definitions

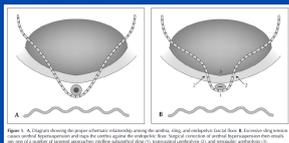
- **Voiding Dysfunction**
 - Abnormality of the voiding phase of micturition that results in voiding symptoms (slow stream, hesitancy, stranguria, positional voiding, etc) and/or incomplete emptying or urinary retention
 - May be due to a bladder or outlet abnormality
- **Obstruction**
 - Increased outlet resistance during voiding that may result in voiding symptoms, incomplete emptying, or urinary retention

Aetiology

- **Obstruction / Incomplete Emptying**
 - Excessive tension on the sling
 - ? Location of the sling (too close to BN for MUSS)
 - Postoperative cystocele or other prolapse
 - "Relative" impaired detrusor contractility
 - Habitual voiding by abdominal straining (rare)
- **Storage Symptoms**
 - DO with obstruction
 - DO without obstruction
 - "Sensory urgency"

Aetiology

- Hypersuspension or kinking of urethra leading to obstruction
- Detrusor muscle unable to overcome increased urethral resistance



Sweeney DJ, Leng WW: Treatment of postoperative voiding dysfunction following incontinence surgery. *Curr Bladder Dysf Rpts* 2007, 2:21-26

Obstruction Caused by Slings

- All SUI procedures have the propensity to cause varying degrees of obstruction
- Some studies suggest that for slings increased outlet resistance as measured by increased pdet during voiding, is associated with better SUI-specific outcomes¹
- Obstruction requiring intervention after surgery
 - Midurethral synthetic slings 0-4% (RP > TO)²
 - Traditional slings slightly higher – 6.1% for PVS (in SISTER trial)³

1. Kraus SR *Urology* 2011;78:1257-62
 2. Dunn J et al. *Int Urogyn J* 2004;15: 25-31
 3. Albo M et al. *NEJM* 2007; 356: 2143-55

Timing of intervention

- Although timing is debatable, contemporary studies have indicated that symptoms that persist beyond 4 weeks rarely resolve on their own

Rosenblum N, Nitti VW: Post-urethral hypersuspension obstruction. *Curr Opin Urol* 2001, 11:411-416

- Depends on type of sling operation
- Non-synthetic sling: void trials for 8-12 weeks before revision surgery
- Synthetic sling: intervention recommended earlier at 2-4 weeks

Elliott CS, Comiter CV. Evaluation and management of urinary retention and voiding dysfunction after sling surgery for female SUI. *Curr Bladder dysfunct Rep* 2012;7(4): 268-274

A Practical Prospective

- If a sling is done and something really bad happens:
 - Urinary retention (unless desired or accepted)
 - Very bothersome obstructive symptoms
 - Elevated PVR with bothersome symptoms
 - Severe de novo urgency and/or UUI
 - Pain
- Take it down or take it out !!!!!

NYU Langone

Vic Nitti's personal communication

Presentation

- A review of 51 patients presenting for urethrolisis after cystourethropexy or sling procedure showed
 - 75% had irritative symptoms
 - 61% had obstructive symptoms
 - 24% had pure urinary retention
- 12% described gradual onset of symptoms at one year or greater

Carr LK, Webster GD: Voiding dysfunction following incontinence surgery: diagnosis and treatment with retropubic or vaginal urethrolisis. *J Urol* 1997, 157:821-823

Rationale for timing of intervention

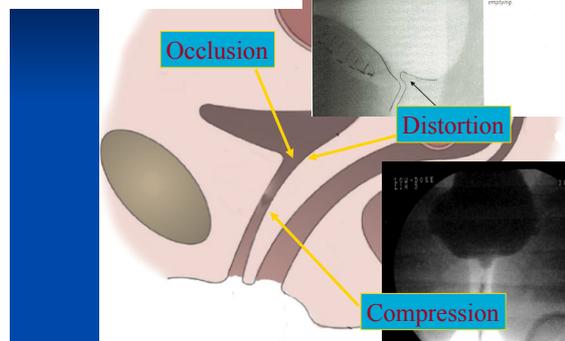
- Greater degree of outlet obstruction is expected with bladder neck sling, and the detrusor may compensate over 1-2 months
- Some degradation of organic tissue occurs over time reducing the obstruction
- Synthetic slings are supposed to have minimal to no tension, and due to permanent nature of the sling, do not degrade

Vasavada SP, Rackley RR, Goldman H, et al. Vaginal Sling Surgery for Stress Urinary Incontinence. In: Novick AC, Jones JS, Gill IS, et al., editors. *Operative urology at the Cleveland Clinic*. Totowa: Humana; 2006. p. 273-83.

Conservative Treatment Options

- Watchful waiting
- Intermittent catheterization
- Indwelling catheter
- Pharmacotherapy to control associated overactivity
- Dilatation (??) – I do not recommend

Anatomical basis



Definitive Treatment Options

<p><u>Midurethral Synthetic Sling</u></p> <ul style="list-style-type: none"> ■ Sling incision ■ Sling loosening (early) ■ Urethrolisis 	<p><u>Traditional Slings</u></p> <ul style="list-style-type: none"> ■ Sling Incision (PV sling) ■ Urethrolisis <ul style="list-style-type: none"> ■ Transvaginal ■ Retropubic ■ Suprameatal (infrapubic) ■ Cut suspension/sling sutures <ul style="list-style-type: none"> ■ <i>No published peer-reviewed series</i>
---	--

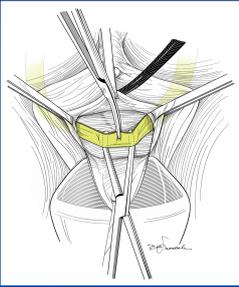
Technique of Mid Urethral Sling Loosening 1-2 weeks

- Infiltrate anterior vaginal wall with 1% lidocaine
- Open vaginal suture line
- The sling is identified and hooked with a right-angle clamp
- Spreading the right angle clamp or downward traction on the tape will usually loosen it (1-2 cm)
- If the tape is fixed, it can be cut
- Reapproximate vaginal wall

Vic Nitti's personal communication

Autologous or Biological Sling Incision

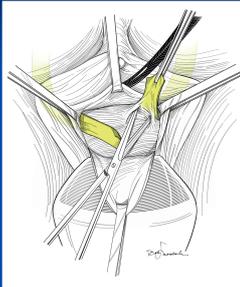
- Inverted U or midline incision
- Isolation of sling in the midline
- Incision of the sling
- *If sling cannot be identified, proceed with formal transvaginal urethrolisis*



From: Vaginal Surgery for The Urologist
Nitti VW, Rosenblum N, Brucker BM Elsevier, 2012

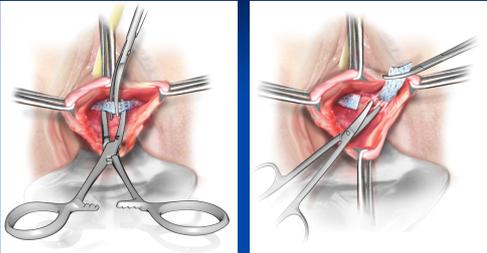
Autologous or Biological Sling Incision

- Freeing of the sling from the underlying urethra
 - May require sharp or blunt dissection
- No perforation of the endopelvic fascia
- No freeing of the urethra from the pubic bone
- Closure of the vaginal wall



From: Vaginal Surgery for The Urologist
Nitti VW, Rosenblum N, Brucker BM Elsevier, 2012

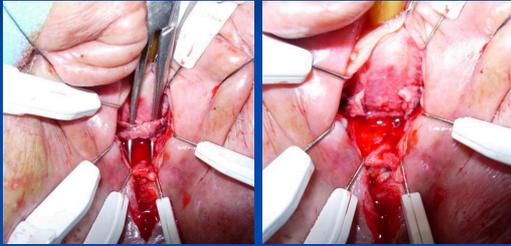
Midurethral Synthetic Sling Incision



- If the sling is difficult to identify, can go lateral to the midline especially for TO slings
- It is critical to identify the sling with certainty (consider pathologic confirmation)

Illustrations from Vaginal Surgery for The Urologist
Nitti VW, Rosenblum N, Brucker BM Elsevier, 2012

Obstructing Midurethral Sling at 11 months





TVT Take Down Results

	N	Type	Success
Klutke, et al ^{1*}	17	Midline Incision	100% normal emptying
Rardin, et al ^{2**}	23	Midline Incision Loosening	100% normal emptying 30% complete, 70% partial resolution of storage sx.

* Recurrent SUI in 6%
** Significant recurrent SUI 13%
26% recurrent SUI, but significantly better than prior to TVT

1. Klutke C, et al. Urology 2001;58:697-701.
2. Rardin CR, et al. Obstet Gynecol 2002;100:898-902.

Outcomes of Midurethral Sling Revision for Voiding Dysfunction: Multicenter Retrospective Study

Molden, S et al FPMRS 2010;16:340-44

- 175 patients (70% RP and 30% TO)
 - 54% cut (mean 71 days)
 - 29% excised (mean 102 days)
 - 18% pulled down (mean 9 days)
- Outcomes
 - Voiding symptoms resolved in 81%
 - Storage symptoms resolved in 75%
 - De novo SUI in 21%
 - De novo OAB in 12%

Resolution of VD independent of method and timing of revision

SUI less likely with early revision

Early vs Late Midline Sling Lysis Results in Greater Improvement in LUTS

South MMT, et al Am J Obstet Gynecol 2009;200:564.e1-564.e5

- 112 women of which 74 (66%) has early lysis < 1 year vs. 38 (34%) who had late lysis > 1 year

Variable	Early lysis (n = 74)	Late lysis (n = 38)	P value
Age (yr)	61 ± 13	59 ± 13	.23*
Menopausal	56 (75.7)	32 (84.2)	.04*
Midurethral sling	27 (36.5)	3 (7.9)	.001*

Sling type	Overall improvement		
	Early lysis	Late lysis	P value
Midurethral	25 (93)	1 (33)	.04*
Pubovaginal	42 (89)	26 (74)	.08

Data are presented as n (%).
* P values from Fisher's exact test.
† South. Early vs late midline sling lysis results in greater improvement in lower urinary tract symptoms. Am J Obstet Gynecol 2009.

May be the patients more than the timing

Traditional Sling Incision Results

	N	Type	Success	SUI
Nitti, et al ¹	19	Midline Incision	84%	17%
Amundsen, et al ²	32	Various	94% retention 67% UUI	9%
Goldman ³	14	Midline Incision	93%	21%

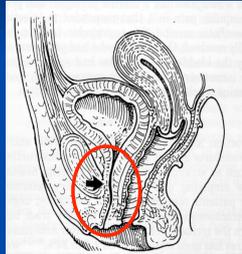
1. Nitti VW, et al. Urology 2002;59:47-52.
2. Amundsen CL, et al. J Urol 2000;164:434-7.
3. Goldman HB. 2003;62:714-8.

Formal Urethrolisis: Indications after Sling Surgery

- Failed sling incision (any material)
- Inability to identify autologous or biological sling
- In certain cases where there is consideration to another sling in the same setting

Urethrolysis - Anatomy

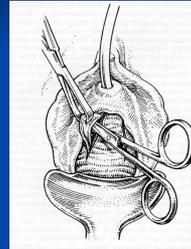
- Urethra may be fixed to the pubic bone with dense scar tissue
- Goal of urethrolysis is to completely free & mobilize urethra



From: Nishimura P, et al. Urol 1994; 122:93-8

Transvaginal Urethrolysis

- Inverted U incision
- Lateral dissection above periurethral fascia
- Endopelvic fascia sharply perforated and retropubic space entered



From: Nishimura P, et al. Urol 1994; 122:93-8

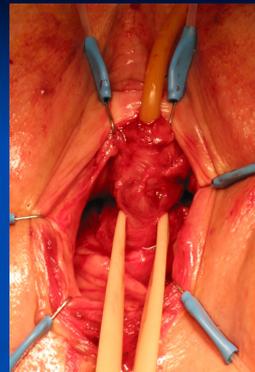
Transvaginal Urethrolysis

- Sharp and blunt dissection freeing the urethra from the undersurface of the pubic bone
- Index finger placed between pubic bone and urethra

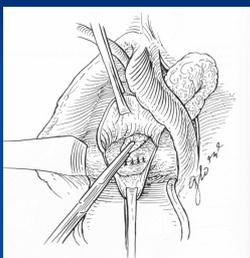


Illustrations from Vaginal Surgery for The Urologist Nitti VW, Rosenblum N/Brucker BM Elsevier, 2012

- Place penrose drain around the urethra

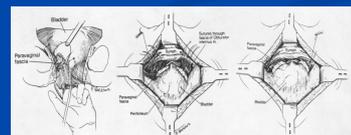


Transvaginal Urethrolysis Optional - Interposition of Martius Flap



Retropubic Urethrolysis

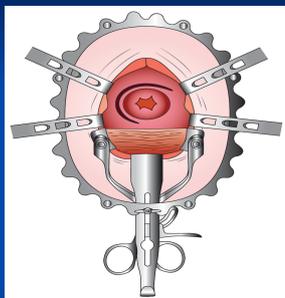
- Mobilization of urethra by sharp dissection
 - Restore complete mobility to anterior vaginal wall
- Paravaginal repair
- Interposition of omentum between urethra and pubic bone



From: Webster GD and Pickett JC. Urol 1989; 134:177-8

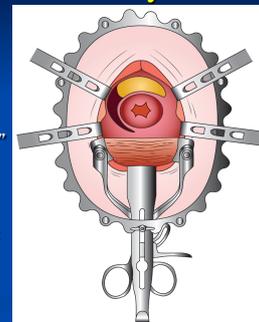
Suprameatal Urethrolisis

- Curved incision above the urethra



Suprameatal Urethrolisis

- Sharp dissection of urethra and bladder neck off pubic bone
 - Pubourethral, pubovesical "ligaments" incised
 - Retropubic space entered
 - Lateral attachments left
 - Care to avoid injury to autonomic nerves
- Martius flap



Urethrolisis Results

	N	Type	Success	SUI
Foster & McGuire	48	Transvaginal	65%	0
Nitti & Raz	42	Transvaginal	71%	0
Cross, et al	39	Transvaginal	72%	3%
Goldman, et al	32	Transvaginal	84%	19%
Petrou, et al	32	Suprameatal	67%	3%
Webster & Kreder	15	Retropubic	93%	13%
Petrou & Young	12	Retropubic	83%	18%
Carr & Webster	54	Mixed	78%	14%

Urethrolisis – Predicting Outcome

- No consistent predictors of outcome
 - Only factor predictive of failure was increased PVR (Nitti & Raz)
 - Higher success in spontaneous voiders vs. those on catheterisation (Foster & McGuire)
 - 74% vs. 54%
 - No difference for retention vs. irritative symptoms (Petrou, et al)
 - 65% vs. 67%

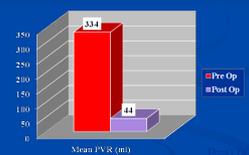
Repeat Incontinence Procedure With Urethrolisis

- Not routinely necessary after sling incision or transvaginal urethrolisis
 - Decision can be made at the time of surgery based on operative findings
 - Recurrent SUI rates 0 - 19% if no repeat SUI surgery
- May consider when there is persistent SUI associated with obstruction
 - "Loose" sling preferred

Repeat Urethrolisis

Scarpero, et al, J Urol, 2003;169:1013-1016

- Normal emptying with relief of obstructive symptoms in 22/24 (92%)
 - PVR ≤ 100 ml
- 20/22 (91%) catheter dependent patients no longer needed to catheterize
- 2 non-catheter dependent patients had PVR = 0



Repeat Urethrolysis

Scarpero, et al, J Urol, 2003;169:1013-1016

<p><u>Urgency Incontinence</u></p> <ul style="list-style-type: none"> ■ 2/16 (12%) resolved ■ 11/16 (69%) improved - required anticholinergics ■ 3/16 (19%) no improvement 	<p><u>Stress Incontinence</u></p> <ul style="list-style-type: none"> ■ 4/22 (18%) de novo SUI ■ 2 had persistent SUI ■ 5 women had bulking and 4 were improved
---	---

Transvaginal Urethrolysis After Prior Failed Urethrolysis

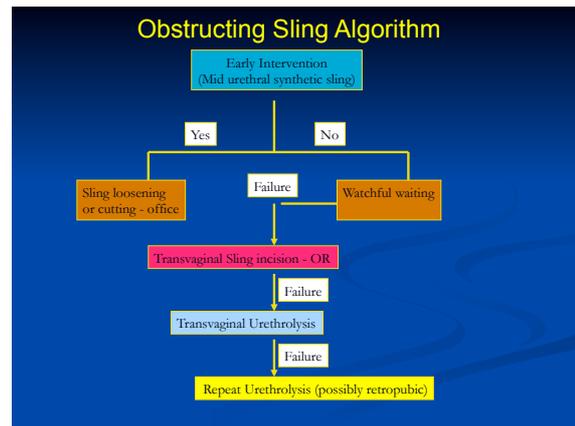
McCreary and Appell Int Urogynecol J, 2007;18:627-633

- 23 procedures in 21 patients
 - Mean 1.72 prior procedures
- 18 patients with obstructive symptoms/findings
 - 13 cured (72%)
 - 9 of 14 catheter dependent patients cured (64%)
- 17 with storage symptoms
 - 10 cured (59%)
 - 6 improved (35%)

Interstim for Persistent OAB Symptoms After Urethrolysis

Starkman et al, Int Urogynecol J 2008; 19:277-282

- 8 women who failed at least 2 anticholinergics
- Mean time from urethrolysis to SNM 11.9 months (3-26)
- 6 responded mean f/u 15.7 months (6-34)
 - 3 OAB symptoms completely resolved
 - PGI-1 "very much improved"
 - 3 improved (1-2 UUI episodes/week)
 - PGI-1 "much improved"



Summary

- Clinically significant obstruction after sling surgery incontinence surgery may not be "common" but occurs even in the most experienced hands
- Sling incision and urethrolysis, by a variety of techniques, are successful in restoring emptying and relieving LUTS in a majority of cases
 - Some studies "suggest early rather than late is better"
- The diagnosis is most often made based on clinical grounds rather than testing

Risk factors

<p>INDIVIDUAL</p> <ul style="list-style-type: none"> ■ High PVR ■ Pelvic organ prolapse 	<p>TECHNICAL</p> <ul style="list-style-type: none"> ■ Reduction of POP ■ Cough testing ■ Premature tape deployment <p>TAPE UNDER TENSION</p>
--	---

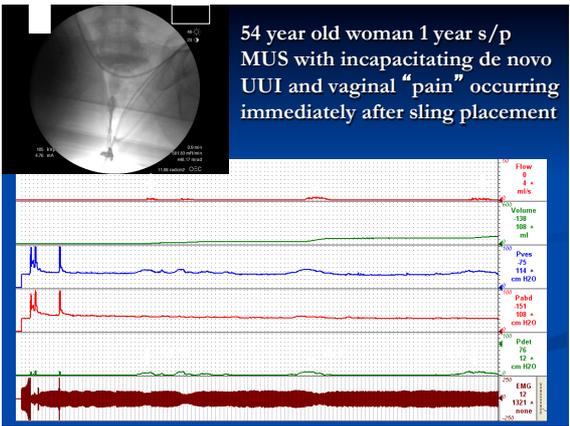
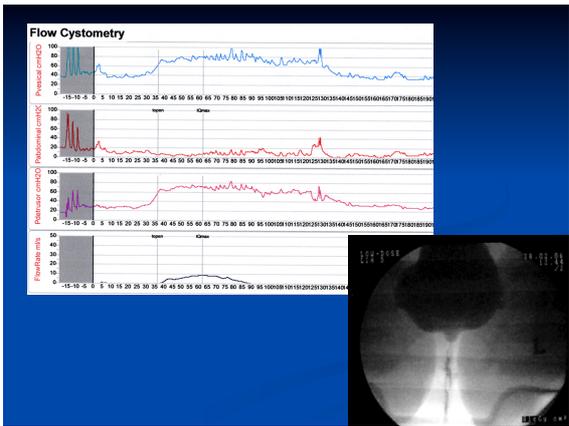



After midurethral sling...

- Many have partial retention early post op
 - Anaesthesia, analgesia, discomfort, oedema, haematoma
 - Altered voiding dynamics
- Must be reviewed early to check resolution; most improve and do well
- Complete retention needs close management
- **WHEN WOULD THE FACULTY ACT IN A PATIENT WITH RETENTION AFTER A SLING?**

Assessment

- History
 - Complete or partial retention, change over time
 - Urodynamic risk factors
 - Surgical risk factors; technical, haematoma
 - Persistent incontinence
- Physical examination is crucial
- Urodynamic tests;
 - flows and PVR, ?voiding cystometry



TVT - Retention

♀ 56 Years

- 2 vaginal deliveries
- Vaginal hysterectomy at age 47
- TVT at age 56
- Postop. urinary retention
- Suprapubic catheter diversion
- Recurrent UTI & antibiotics

TVT - Retention

♀ 56 Years

Diagnostic Studies ?

- Vaginal speculum
- Ultrasound
- Cystogram, VCUG
- Urethrocystoscopy
- Urodynamics

TVT - Retention

♀ 56 Years

- Cystocele III°
- Ø urethral hypermobility
- Vaginal apex well fixated
- Ø rectocele



TVT - Retention

♀ 56 Years



TVT - Retention

♀ 56 Years

Therapeutic Options ?

- Vaginal pessary
- TVT transection / resection
- Cystocele repair
- Combined TVT resection - cystocele repair

TVT - Retention

♀ 56 Years

Combined TVT Resection & Cystocele Repair

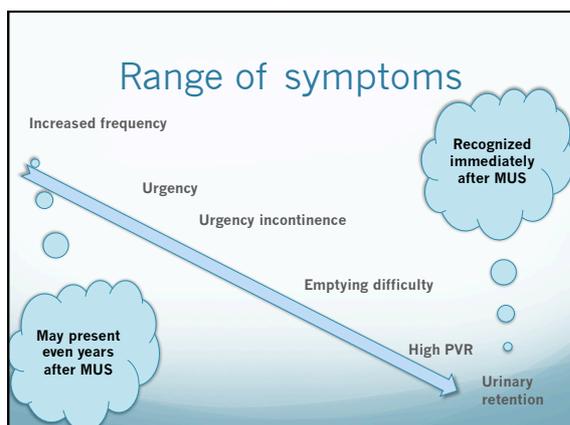
⇒ continent, spontaneous voiding

Voiding Dysfunction after Sling Surgery: Evaluation and Diagnosis

Tufan TARCAN, MD, PhD
Marmara University School of Medicine
Istanbul, Turkey

The aim of the evaluation of a patient with VD after MUS

- To find out the etiology & best treatment option
- Particularly: to delineate patients who will benefit from a urethral release surgery
- No clear consensus on evaluation, especially on urodynamic investigation



Classification of de novo VD after MUS

Type of Voiding Dysfunction	Etiology
• Urinary retention	• Obviously obstructed • Easiest to decide
• De novo emptying difficulty, high PVR	• Most probably obstructed • Relatively easy to decide
• De novo urgency	• Is she obstructed? • Lets start antimuscarinics... • If they don't work, perform PFS

Clinical evaluation differs depending on the symptom

Type of VD	Clinical evaluation
• Urinary retention	• Physical examination + PVR
• Emptying difficulty + high PVR	• All of above + uroflowmetry, (optional: K/B Ultrasound, cystoscopy)
• De novo urgency	• All of above + F/V charts + urodynamics with PFS

Group 1: Urinary retention

- Clinical evaluation starts with the first voiding trial after MUS
- Bladder should not be overfilled for the first voiding trial
 - Backfill-assisted voiding trial is associated with less failures (Foster et al, 2007)
- 16% of patients who pass the initial voiding trial may fail on the second (Wheeler et al, 2008)
 - More than one successful voiding is advised prior to discharge

When First Voiding Trial Fails...

- Postoperative VD in the early postoperative period may be transient...
 - Kim et al, 2012
- One-third of the failures can empty their bladders in subsequent trials.
 - Kim et al, 2012
- CIC or indwelling cath. is temporarily started

CIC or indwelling cath. in early urinary retention

- Duration of cath. varies from 1 to 4 weeks after MUS
 - Patient's preference
 - Surgeon's preference
- CIC should be preferred (>1 w)
 - Less UTI
 - Social compliance
 - Monitoring PVR
- Symptoms that persist beyond 4 weeks rarely resolve spontaneously
 - Definitive treatment is indicated at 2-4 ws
 - Rosenblum N et al, 2001
- Long term urinary retention: cath. dependency >4 ws
 - Appeal et al, 2009, AUA guidelines

Group 2: Emptying difficulty + high PVR

- Low flow rate
 - No distinct cut-offs
 - Better to compare to preop. findings
- Definition of high PVR ?
 - Proportional definitions such as 20 to 50% of the bladder capacity
 - Clearly defined levels of PVR ranging from 100 to 150 ml
 - Christopher S et al, 2012
 - Bother of the patient is important
- Upper urinary tract should be checked in long-lasting symptoms

Emptying difficulty + high PVR

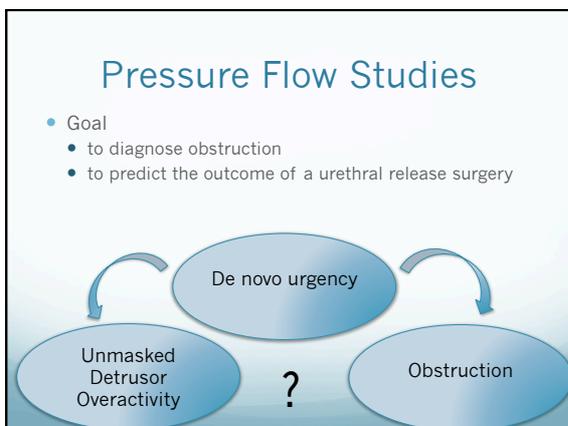
- Do we need PFS to show obstruction ?
 - No
- Diagnosis of obstruction depends on the temporal relationship between MUS and onset of symptoms
 - If these symptoms were not present preoperatively, but clearly appear after a MUS surgery the most probable cause is mesh-related obstruction.
 - Definitive treatment to cure obstruction is indicated
 - Carr & Webster, 1997

Group 3: De novo urgency after MUS

- Timing of symptoms
 - Patients with mild or intermediate symptoms may be under-diagnosed and present even years after sling surgery.
 - 12 % have a gradual onset of symptoms as remote as one year or greater
 - Carr and Webster, 1997
- The assessment of temporal relation between surgery and symptoms may be difficult

De novo urgency after MUS: Basic evaluation

- UTI, POP, vaginal extrusion, erosion to the urethra or bladder must be excluded
- Pelvic examination:
 - overcorrection of the urethral axis with bladder neck or midurethral kinking
- Urine analysis and cultures
- Uroflowmetry +PVR
- Imaging
- Cystoscopy
 - in the presence of any clinical suspicion, e.g. hematuria or persistent UTI, groin or leg pain



What is the problem?

- Women empty their bladders by relaxing the pelvic floor,
 - sometimes with the additional help from the abdominal muscles
 - without a strong detrusor contraction compared to men.
- Small changes in Pdet may define BOO
 - Difficult to develop reliable diagnostic nomograms
- Many women cannot void in PFS
 - Obstructive effect of the cath.

Suggested criteria for female BOO (1)

- Qmax of 15 ml/s or less combined with pdetQmax of 15 cm H2O or more
 - Had a sensitivity of 80 % and a specificity of 83.1 % for BOO.
 - Chassagne et al, 1998
- The same group revised their cutoff values
 - Using women with SUI as controls
 - Lemack, G. E. 2000
 - Asymptomatic women as controls.
 - Defreitas, G. A. 2004
- Highest sensitivity and specificity were at **Qmax 12 ml/s or less and pdetQmax 25 cm H2O or greater.**

Suggested criteria for female BOO (2)

- **Video UDS:** radiographic evidence of obstruction between the bladder neck and distal urethra in the presence of a sustained detrusor contraction of any magnitude during voiding...
 - no strict pressure flow criteria
 - Nitti et al, 1999
- Nomogram based on **noninvasive Qmax and pdetmax**
 - Blaivas & Groutz, 2000

Suggested criteria for female BOO (3)

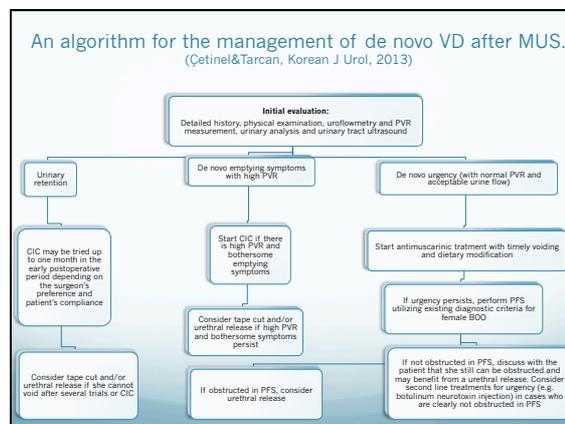
- Comparison of 5 contemporary urodynamic definitions for female BOO on women who underwent videoUD
 - Video-UD criteria and 1998 cutoff point criteria had the highest concordance.
- The Blaivas-Groutz nomogram overestimates obstruction
 - Not to be used as the sole definition of BOO
 - Akikwala et al, 2006

Do not delay definitive treatment in obstructed cases!

- Pts with pure de novo urgency are empirically treated by antimuscarinics and conservative measures
- Invasive UDS are spared to non-responders
- Better outcome in early intervention in obstructed cases
 - Protection of bladder function
 - South MM, 2009, Leng WW, 2004

I wish I had urodynamics preoperatively.....

- Compare the preoperative and postoperative urodynamic studies, if they both exist!
- Weak recommendation for invasive UDS for an index patient with SU1 prior to MUS surgery
 - Nager CW et al, 2012

Conclusion

- Temporal relationship between MUS and onset of symptoms
 - The single most important factor in the diagnosis of sling-related obstruction
- PFS are usually spared for cases with de novo urgency, however, urodynamic criteria for female BOO are imprecise.
- Diagnosis of obstruction should depend on a combination of clinical parameters and invasive/ non-invasive urodynamic findings.

Thank you

Voiding Dysfunction after Sling Surgery

Aims and Objectives

Sling surgery is the most common procedure performed to treat stress urinary incontinence(SUI) in women. Although most of women obtain cure of incontinence after surgery, a small minority develops voiding dysfunction clinically manifested as significant post-void residual, poor flow rate, urgency and urgency incontinence or pelvic pain which quite often are not easy to deal with. In the absence of clear guidelines, evaluation and management of post-sling voiding dysfunction continues to be controversial particularly in regards to time and choices of therapy.

The aim of this workshop is to discuss the different options for the evaluation and management of voiding dysfunction after sling surgery for SUI.

Educational Value

After taking part in this workshop participants will be able to identify and properly manage voiding dysfunction after sling surgery for SUI including: evaluation, timing and methods of intervention and outcomes. Typical clinical cases of those different scenarios of postoperative voiding dysfunction will be openly discussed with the attendants. Decision tree analysis through Evidence Base Medicine tools will be used.

Description

Topics to be covered during the workshop will include:-Introduction:-Postoperative voiding dysfunction: definition and epidemiology. Etiology of postoperative voiding dysfunction after sling surgery. Risk factors for postoperative voiding dysfunction.-Evaluation and diagnosis: Evaluation for potential postoperative problems. Evaluation of urinary retention. Role of urodynamics. -Treatment and outcomes: Conservative treatment. Medical treatment. Surgical approach. Recurrent stress urinary incontinence. Evaluation of postoperative voiding dysfunction following sling surgery. Timing of intervention. Operative failures or non-obstructed patients. Clinical case discussion including the different scenarios of postoperative dysfunction will be shown in a step up approach finding the most appropriate evidence based management.

Speakers

Prof. Dr. David Castro-Diaz. University of La Laguna. Spain

Prof. Dr. Tufan Tarcan, Marmara University. Istanbul. Turkey

Prof. Dr. Christopher Chapple, Royal Hallamshire Hospital, University of Sheffield.UK

Schedule

09.00.-Introduction

09.05.-Postopetative voiding dysfunction. Physiopathology and risk factors

D. Castro-Diaz

09.25.-Discussion

09.30.-Evaluation and diagnosis

T. Tarcan

09.50.-Discussion

10.00.-Treatment and outcomes

C. Chapple

10.20.-Discussion

10.30-11.00 Break

11.00-12.00 Case discussion on postoperative voiding dysfunction after sling surgery.

-Urinary retention

-High post-void residual

-Poor urinary flow

-Urinary frequency

-Urgency incontinence

-Pelvic pain

Audience

Urologists and Gynaecologists

Level

Advanced

Keywords: Urinary stress incontinence, Urethral sling, Voiding dysfunction, Female

Postoperative voiding dysfunction

Incidence, Physiopathology and risk factors.

David Castro-Diaz

University Hospital of the Canary Islands. University of La Laguna

Spain

Stress urinary incontinence in women is a very old problem for which more than 200 surgical procedures have been described with no one providing perfect outcome [1]. Within the last decade there has been a shift from classic techniques, mostly colposuspension and pubovaginal sling procedures, to midurethral synthetic tapes which have currently become the gold standard for the management of SUI, with several hundred thousand women been operated every year [2].

Voiding dysfunction after sling surgery is typically diagnosed when a patient shows de-novo symptoms or signs of lower urinary tract dysfunction including: urinary retention, high post-void residual urine, poor urinary flow, urinary frequency, urinary urgency, urinary urgency incontinence or pelvic pain. If these symptoms arise right after the sling procedure, the diagnosis of postoperative lower urinary tract dysfunction can be easily made. However sometimes this is not the case as symptoms may gradually develop even one year after the procedure [3].

Incidence

The incidence of postoperative voiding dysfunction across various procedures is variable and is difficult to compare. Historically the incidence of postoperative voiding difficulties lasting longer than 4 weeks occurred in 3% to 7% of patients undergoing Burch procedures, in 4% to 8% of those undergoing transvaginal needle suspensions, and in 3% to 11% of patients undergoing sling procedures. The reported incidence of voiding dysfunction, including urinary retention and de novo urgency and urge UI, following midurethral sling procedures ranges from approximately 2% to 25% [4]. This variability in the incidence of has been attributed to differences in recognition and diagnosis of urethral obstruction due to urethral hyper suspension as the lack of consistent clinical and diagnostic urodynamic criteria remain a dilemma. Furthermore, patient loss to follow-up may be an important confounding factor [5].

Physiopathology and risk factors.

Surgical intervention for voiding dysfunction and urinary retention has been reported in 0% to 5% of patients undergoing midurethral sling [4], while short-term voiding difficulties following Burch procedure appear to be more likely than following TVT [6] and it seems to be also the case for

pubovaginal slings as compared with TVT [7]. This may be easily explained because midurethral sling procedures are mechanically tension free likely resulting in an overall lower incidence of postoperative voiding dysfunction than seen with other types of open SUI. Transobturator slings have been found to promote a lower rate of postoperative voiding dysfunction than retropubic TVT. It has been observed that in patients undergoing midurethral sling placement, urinary retention and de-novo urgency / urge incontinence is less likely when using the transobturator versus the retropubic approach [8-10]. In addition to a lower incidence of de-novo urgency and urge incontinence, retrospective data suggests that resolution of preoperative detrusor overactivity is also greater in patients undergoing transobturator midurethral slings as compared to retropubic midurethral slings and bladder neck slings (47 % resolution versus 35 % and 14 % respectively) [11].

Voiding dysfunction after sling surgery is mostly related to varying degrees of urethral obstruction created by the sling [3]. In cases of complete urinary retention the detrusor muscle is not able to overcome the augmented urethral resistance created by the sling. In cases of milder postoperative voiding dysfunction, when there is no complete retention, but the patient expresses symptoms of frequency, urgency, urgency incontinence with or without poor urinary flow and poor urinary flow, the sling may be only partially obstructive. In these circumstances diagnoses are not easy to make because at least some postoperative increase in urethral resistance has been noted to occur after sling placement [12].

Voiding pressure (PdetQmax) has been shown to be increased after pubovaginal sling procedure suggesting that this technique might promote bladder outlet obstruction [13]. However it is not clear whether or not tension free mid urethral slings increase voiding pressure as contradictory data exist with some studies suggesting increase of voiding pressure [14], while others have found no change in Pdet Q max after the procedure [15]. Consequently the evidence for postoperative obstruction after a successful midurethral sling surgery is rather weak. Given the finite incidence of urinary retention and de-novo voiding dysfunction after midurethral sling surgery, one can certainly surmise that at least some element of obstruction must occur likely being the main cause of postoperative voiding dysfunction particularly if we consider that many women suffering of SUI void their bladder by relaxing the pelvic floor and with low or no increase in detrusor pressure. In this particular group of patients minimal obstruction may explain retention and postoperative voiding dysfunction after a correct placement of a midurethral sling. On the other hand detrusor overactivity at higher volumes might be unmasked after the procedure as storage of urine in the bladder is more effective after resolution of incontinence [17].

Some other risk factors for postoperative voiding dysfunction include advanced patient age, the presence of a high postvoid residual volume, and the use of Valsalva effort to void during preoperative urodynamic evaluation [16]. Furthermore the risk of either urinary retention or voiding dysfunction is increased in patients who have undergone prior prolapse surgery, prior incontinence surgery, and in those with a maximum urinary flow rate less than 15 ml /second [16-18].

References

1. -Bent AE. Stress urinary incontinence. In: The Linde's Operative Gynaecology 2008.10th ed. Lippincott Williams & Wilkins.
2. -Wu JM, Kawasaki A, Hundley AF, et al. Predicting the number of women who will undergo incontinence and prolapse surgery, 2010 to 2050. *AM J Obstet Gynecol.*2011;205:230.
3. -Carr LK, Webster GD. Voiding dysfunction following incontinence surgery: diagnosis and treatment with retropubic or vaginal urethrolysis. *J. Urol.* 1997; 157:821.
- 4.-Taneja SS. In complications of Urologic surgery 4th ed. 2010. Saunders Elsevier
- 5.-Sweeney DD, Leng WW. Treatment of postoperative voiding dysfunction following incontinence surgery. *Curr Blad Dysfun Rep.* 2007, 2:21-26.
- 6.- Ward K, Hilton P. United Kingdom and Ireland Tension-free Vaginal Tape Trial Group, et al: Prospective multicentre randomised trial of tension-free vaginal tape and colposuspension as primary treatment for stress incontinence. *BMJ* 2002; 325:67.
7. Wadie BS, Edwan A, Nabeeh AM, et al: Autologous fascial sling vs polypropylene tape at short-term followup: a prospective randomized study. *J Urol* 2005; 174:990-993.
- 8.- Morey AF, Medendorp AR, Noller MW, et al: Transobturator versus transabdominal mid urethral slings: a multi-institutional comparison of obstructive voiding complications. *J Urol* 2006; 175:1014-1017.
- 9.- Richter HE, Albo ME, Zyczynski HM, et al. Retropubic versus transobturator midurethral slings for stress incontinence. *N Engl J Med.* 2010;362:2066
- 10.- Schierlitz L, Dwyer PL, Rosamilia A, et al. Effectiveness of tension-free vaginal tape compared with transobturator tape in women with stress urinary incontinence and intrinsic sphincter deficiency: a randomized controlled trial. *Obstet Gynecol.* 2008;112:1253.
11. Gamble TL, Botros SM, Beaumont JL, et al. Predictors of persistent detrusor overactivity after transvaginal sling procedures. *Am J Obstet Gynecol.* 2008;199:696 e1.

- 12.-Elliot CS, Comiter CV. Evaluation and management of urinary retention and voiding dysfunction after sling surgery for female stress urinary incontinence . *Curr Bladder Dysfunct Rep* (2012) 7:268–274
Curr Bladder Dysfunct Rep
- 13.- Kraus SR, Lemack GE, Richter HE, et al. Changes in urodynamic measures two years after Burch colposuspension or autologous sling surgery. *Urology*. 2001;78:1263.
14. Sander P, Moller LM, Rudnicki PM, et al. Does the tension-free vaginal tape procedure affect the voiding phase? Pressure-flow studies before and 1 year after surgery. *BJU Int*. 2002;89:694.
15. Moran PA, Ward KL, Johnson D, et al. Tension-free vaginal tape for primary genuine stress incontinence: a two-centre follow-up study. *BJU Int*. 2000;86:39.
16. Alperin M, Abrahams-Gessel S, Wakamatsu MM. Development of de novo urge incontinence in women post sling: the role of preoperative urodynamics in assessing the risk. *Neurourol Urodyn*. 2008;27:407.
17. Mutone N, Brizendine E, Hale D. Factors that influence voiding function after the tension-free vaginal tape procedure for stress urinary incontinence. *Am J Obstet Gynecol*. 2003;188:1477.
18. Cho ST, Song HC, Song HJ, et al. Predictors of postoperative voiding dysfunction Following transobsturator sling procedures in patients with stress urinary incontinence. *Int Neurourol J*. 2010;14:26.

Voiding Dysfunction after Sling Surgery

Evaluation and Diagnosis

T. Tarcan

Marmara University. Istanbul. Turkey

Introduction

The methodology of clinical evaluation of a patient with voiding dysfunction (VD) after a midurethral sling (MUS) remains controversial. The presenting symptoms may vary in terms of the type and the severity in a range between urinary frequency and urinary retention. The pathophysiology of VD after MUS is not well understood although it is believed to be related to the urethral obstruction or irritation by the mesh in the majority of the cases [1]. Other causes such as bladder perforation, pelvic hematoma, urethral erosion or vaginal extrusion of the mesh should always be considered in the differential diagnosis. Although, obstruction appears to be the main etiological factor there is not a precise method to diagnose obstruction and predict the patients who will benefit from a urethral relieve surgery [2,3]. This part of the workshop will focus on the clinical and urodynamic evaluation of a patient with VD after MUS aiming to find the etiology and the appropriate treatment.

First Voiding Trial after MUS

The initial clinical evaluation of a patient after MUS starts at the time of the first voiding trial after surgery. There are several methods to perform the first voiding trial that can affect the incidence of VD. For example, Foster et al have shown that women after MUS are more likely to empty their bladders effectively before discharge if they are evaluated with a backfill-assisted voiding trial compared to spontaneous natural bladder filling and emptying [4]. Kim et al have further shown that postoperative VD is common in the early postoperative period but may be transient and associated with the immediate voiding conditions following surgery such as increased fluid load and bladder overdistention [5]. The latter study has shown that that even among patients who fail the initial voiding trial, 36.8% successfully can void on subsequent trials. On the other hand, Wheeler et al have demonstrated that 16.4% of patients who pass the initial voiding trial may fail on the second [6]. The aforementioned studies suggest that the bladder should not be overfilled for the first voiding trial and approximately 1/3 of the failures can successfully empty their bladders in subsequent trials.

When the patient cannot void after MUS surgery many surgeons prefer indwelling bladder catheterization up to one week (3 to 7 days) and re-test the patient after catheter removal. There is however almost no consensus in the literature about the strategy to follow when the voiding trial one

week after sling surgery fails. In cases of retention lasting longer than one week some surgeons prefer an early surgical intervention to cut the tape whereas some prefer to switch to clean intermittent catheterization as advocated by Elliott and Comiter [7]. However, there is a paradigm shift among surgeons toward earlier intervention since delayed time to urethrolysis and longstanding obstruction can potentially lead to irreversible bladder dysfunction.

Clinical Evaluation of Persistent VD after MUS

Women who present with any type of LUTS anytime after a MUS surgery have to undergo a thorough clinical assessment that includes a detailed history, physical examination, urine analysis and culture, frequency-volume charts (FVC), validated symptom and Q&L scores, radiological evaluation and uroflowmetry with post-void residual (PVR) measurement. For referral patients, operative reports indicating the type of sling surgery and the mesh, the preoperative symptoms and preoperative urodynamic findings (if they exist) should be known. Invasive (video) urodynamic studies and cystoscopic evaluation should be the secondary steps in cases who do not respond to conservative measures or medical treatment. However, urodynamic studies are not recommended for patients who develop postoperative retention but had adequate emptying prior to sling surgery. This situation clearly indicates a urethral obstruction and requires sling incision or urethrolysis. Video- urodynamic studies including pressure flow studies are typically reserved for patients where the etiology could not be clarified especially for those who can empty their bladders but have de-novo storage symptoms [7].

The Spectrum of VD after MUS and Timing of Presentation

A detailed history regarding the type and onset of symptoms is the most important part of the basic clinical evaluation. The presenting symptoms may include storage symptoms such as increased frequency, urinary urgency, nocturia and urgency incontinence or, emptying symptoms such as hesitancy, straining to void, weak urinary stream, incomplete emptying and urinary retention. Patients may also present with bladder pain, dysuria or urinary tract infections.

Unfortunately, specific definitions do not exist for postoperative VD after MUS and the definition of VD varies between studies. Urinary retention after MUS may be defined as catheter-dependency for at least 28 days [8]. There is no consensus about the cut off level of PVR after voiding trials that necessitates catheterization. For a clinically significant PVR, some authors propose proportional definitions such as 20 to 50% of the bladder capacity whereas others use clearly defined levels of PVR ranging from 100 to 150 ml [7]. The discomfort of the patient also plays an important role in the decision making for clean intermittent or indwelling catheterization. It is also to note that symptoms that persist beyond 4 weeks after sling surgery rarely resolve spontaneously [9].

The timing of symptoms is the best diagnostic parameter to understand the etiology so that symptoms that were not present preoperatively but appear after a MUS surgery should be considered as mesh- or surgery-related. Supporting that view, Patel et al have indicated “the temporal relationship between the sling procedure and onset of symptoms” as the single most important factor in the diagnosis

of sling-related obstruction or VD [8]. However, it should also be kept in mind that VD may develop insidiously and in these cases VD may not be easily related to the previous MUS surgery. For example, Carr and Webster have reported that in women with postoperative VD following prior incontinence surgery, 12 % of them described a gradual onset of symptoms as remote as one year or greater (2). It has also been suggested that mild symptoms after MUS are under-diagnosed and under-reported that in part may play a role in cases of insidious onset [10]. A high index of suspicion is certainly needed in cases with insidious onset of symptoms following MUS surgery.

Risk Factors to Note

Many authors have studied the preoperative urodynamic and clinical parameters to predict VD after a sling surgery. During the clinical evaluation of a patient with postoperative VD, it may be helpful to re-consider those findings although contradiction in the literature exists.

For example, the type of MUS surgery and concomitant vaginal surgeries, age and parity may affect the incidence of postoperative VD. In a meta-analysis, postoperative urinary retention was found to be slightly more in women undergoing RPMUS than those undergoing TOMUS [11]. Brubaker et al also reported that VD requiring surgery (and/or catheter use) was more common after RPMUS compared to TOMUS [12]. Houwing et al have compared VD rates and the need for reoperation between patients having MUS procedures alone versus those having MUS procedures with concomitant prolapse repair [13]. They have found that RP- or TOMUS with concomitant prolapse repair had a higher incidence of VD in the immediate postoperative period that however did not persist to the six-week follow-up visit. The authors concluded that there was no greater risk of lasting VD or need for reoperation after concomitant procedures.

Several authors have suggested that preoperative urodynamic findings indicating relatively impaired detrusor contractility may predict postoperative VD. For example, Kleeman et al have shown that a preoperatively high PVR was a significant risk factor in predicting the postoperative VD after different types of anti-incontinence and prolapse surgeries [14]. In another study, Miller et al have found that no other preoperative urodynamic parameters but a detrusor pressure less than 12 cmH₂O was significantly associated with urinary retention after pubovaginal sling surgery [15]. On the other hand, Hong et al have shown a low preoperative urine flow rate to be the only predictive preoperative factor for postoperative VD after RPMUS [16]. Although heterogenous findings and disagreement do exist, impaired detrusor contractility may be a risk factor for VD and especially for urinary retention after sling surgery. Further studies are needed to clarify the exact role of detrusor contractility in the outcome of MUS surgery.

Physical Examination

Physical examination of a patient with VD after MUS surgery should include a basic pelvic inspection with the evaluation of vulva and vaginal introitus, vaginal canal and urethra, together with the assessment of urethral mobility and pelvic organ prolapse. Vaginal extrusion of the mesh or a significant prolapse that bends the vesico-urethral angle causing obstruction should be ruled out. Vaginal examination may also reveal overcorrection of the urethral axis with bladder neck or midurethral kinking.

Stress test should also be applied to rule out persisting SUI. In patients who present with neurological symptoms, dyspareunia or pain, the physician should try to locate the origin of the pain. It should be remembered that neurologic symptoms might occur in groin areas or in suprapubic areas after RPMUS and TOMUS, respectively [12]. Persistent leg pain should raise the suspicion of urethral erosion [17].

Symptom Scores

The utilization of validated symptom scores in the pre- and postoperative periods enables a quantitative comparison of the symptoms and may lead to a more objective assessment of VD after MUS. There are several validated symptom scores recommended by the ICS to assess LUTS in women. Unfortunately, no symptom score exists specifically targeting VD after MUS.

Radiological Evaluation

Ultrasound examination of the urinary tract and pelvis is a cheap, practical and radiation-free method also enabling PVR measurement. Computerized tomography or magnetic resonance imaging may further be utilized in complicated cases. An undiagnosed bladder perforation or pelvic hematoma may cause bladder irritability and de novo urgency that is more common after a retropubic MUS (RPMUS) [18]. Bladder perforation after a transobturator MUS (TOMUS) is relatively uncommon but still possible [19,20]. Voiding cystourethrograms may be better combined with urodynamic studies and can provide a better assessment of mesh related urethral obstruction.

Urodynamic Evaluation and Diagnosis of Obstruction and de Novo Detrusor Overactivity

Urodynamic evaluation of a patient with VD after MUS may include non-invasive tests such as PVR measurement and uroflowmetry and invasive tests such as cystometry and pressure flow studies.

Bladder outlet obstruction in men is defined by the presence of a high pressure and low flow micturition revealed by pressure flow studies [21] whereas diagnosis of obstruction in women lack well-defined urodynamic criteria. Anatomical differences of the female pelvis allow women emptying of their bladder

just by relaxing the pelvic floor, sometimes with the additional help from the abdominal muscles without a strong detrusor contraction compared to men [22]. Therefore, even small changes in detrusor pressure during voiding may define female infravesical obstruction and it is therefore impossible to develop reliable diagnostic nomograms as we have for men. Instead, it may be a better strategy to compare the preoperative and postoperative urodynamic studies in the case of VD after MUS in order to delineate the effect of MUS surgery on micturition. However, the weak recommendation for invasive UDS for an index patient with SUI prior to MUS surgery leads to lesser utilization of preoperative UDS [23]. Thus, in today's practice, preoperative urodynamic data may not be present for comparison in the majority of cases.

The final goal of pressure flow studies is to differentiate patients who will benefit from urethrolisis. However, for many authors the only absolute selection criterion for offering urethrolisis is a clear temporal relationship of symptoms to surgery since PFS may not show classic obstructive voiding in women who benefit from urethrolisis [10]. In an attempt to diagnose female bladder outlet obstruction several authors proposed different urodynamic criteria. In 1998, Chassange et al defined obstruction using cutoff values for Q_{max} and $p_{det}Q_{max}$ [24]. They indicated a Q_{max} of 15 ml/s or less combined with $p_{det}Q_{max}$ of 15 cm H₂O or more to have a sensitivity of 80 % and a specificity of 83.1 % for diagnosing obstruction. The same group revised their cutoff values in 2000 and later in 2004, first using women with SUI and then asymptomatic women as controls [25,26]. In the latter study, the highest sensitivity and specificity for predicting obstruction were at Q_{max} 12 ml/s or less and $p_{det}Q_{max}$ 25 cm H₂O or greater. In another study, Nitti et al proposed criteria for video UDS where obstruction was defined as radiographic evidence of obstruction between the bladder neck and distal urethra in the presence of a sustained detrusor contraction of any magnitude during voiding [27]. Blaivas and Groutz designed a nomogram based on noninvasive Q_{max} and $p_{det}Q_{max}$ [28]. In 2006, Akikwala et al compared these 5 contemporary urodynamic definitions for female BOO on 154 women who underwent videourodynamics to assess their correlation with each other and with clinical suspicion of BOO [22]. They concluded that each urodynamic definition of female BOO had merit whereas video-urodynamic criteria and 1998 cutoff point criteria had the highest concordance. The Blaivas-Groutz nomogram was found to overestimate obstruction compared to the other criteria and suggested not to be used as the sole or standard definition of obstruction in women by Akikwala et al [22].

There are certain factors to be discussed regarding the diagnostic role pressure flow studies. First of all, studies utilizing cutoff points derived their results from patients with clinical obstruction at the onset and not from women with functional obstruction. Furthermore, since obstruction is usually seen with overactive bladder symptoms, it is sometimes difficult to demonstrate obstruction urodynamically especially if there are severe coexisting uncontrolled detrusor contractions. As a consequence of this it is sometimes difficult to differentiate urethral obstruction from de novo urgency without obstruction, if it really exists! It is also to note that about one third of women cannot void in the presence of a cystometry catheter in pressure flow studies.

Are there really cases in which obstruction is suspected clinically but clearly ruled out by urodynamics and vice versa? We certainly need further studies in this area to answer these questions.

Cystoscopy

Cystoscopy should be reserved for patients with hematuria, bladder pain or recurrent cystitis especially when bladder perforation or urethral mesh erosion is suspected. Urethroscopy is indicated to rule out urethral kinking (abnormally vertical urethral axis) in addition to evaluating for sling erosion into the urethra or bladder. Many authors suggest to perform cystoscopy routinely at the time of a urethrolysis operation to rule out infravesical problems.

Summary

The evaluation of a patient with VD after MUS should firstly include all the same basic steps of any female patient's clinical assessment with LUTS to rule out all possible pathologies. Postoperative VD is common in the early period after catheter removal but it is transient in the majority of cases. VD that occurs temporarily after MUS and persists for 4 weeks warrants further treatment since it is related to the urethral obstruction or irritation by the mesh. The spectrum of symptoms may vary in range from simple frequency to urinary retention. Patients with mild or intermediate symptoms may be under-diagnosed and present even years after sling surgery. Secondary steps of evaluation may include cystoscopy, video UDS with PFS usually reserved for patients with persisting de novo storage symptoms that do not respond to conservative and medical treatment. A urethral relieve surgery is certainly needed for patients with unresolved emptying symptoms after MUS where urodynamic studies have little additional value. It should be kept in mind that urodynamic criteria for bladder outlet obstruction in women are imprecise and the diagnosis of obstruction and decision for a urethral relief surgery should depend on a combination of clinical parameters and urodynamic findings.

References

1. Nitti VW, Carlson KV, Blaivas JG and Dmochowski RR: Early results of pubovaginal sling lysis by midline sling incision. *Urology* 2002; 59: 47.
2. Carr LK, Webster GD. Voiding dysfunction following incontinence surgery: diagnosis and treatment with retropubic or vaginal urethrolysis. *J Urol* 157(3): 821-823, 1997.
3. Petrou SP, Brown JA, Blaivas JG. Suprameatal transvaginal urethrolysis. *J Urol* 161(4): 1268-1271, 1999.
4. Foster Sr RT, Borawski KM, South MM, et al. A randomized, controlled trial evaluating 2 techniques of postoperative bladder testing after transvaginal surgery. *Am J Obstet Gynecol.* 2007;197:627 e1.
5. Kim JW, Moon DG, Shin JH: Predictors of Voiding Dysfunction after Mid-urethral Sling Surgery for Stress Urinary Incontinence. *Int Neurourol J* 2012;16:30-36.
6. Wheeler TL 2nd, Richter HE, Greer WJ, Bowling CB, Redden DT, Varner RE. Predictors of success with postoperative voiding trials after a mid urethral sling procedure. *J Urol* 2008;179:600-4.
7. Christopher S. Elliott & Craig V. Comiter: Evaluation and Management of Urinary Retention and Voiding Dysfunction After Sling Surgery for Female Stress Urinary Incontinence. *Curr Bladder Dysfunct Rep.* published on line 14 August 2012. DOI 10.1007/s11884-012-0150-y
8. Patel BN, Kobashi KC, Staskin D. Iatrogenic obstruction after sling surgery. *Nat Rev Urol.* 2012 Jun 5. doi: 10.1038/nrurol.2012.110. [Epub ahead of print]
9. Rosenblum N, Nitti VW: Post-urethral suspension obstruction. *Curr Opin Urol* 2001, 11:411–416.
10. Deng DY, Rutman M, Raz S, et al. Presentation and management of major complications of midurethral slings: are complications under-reported? *Neurourol Urodyn.* 2007;26:46
11. Long CY, Hsu CS, Wu MP, et al. Comparison of tension-free vaginal tape and transobturator tape procedure for the treatment of stress urinary incontinence. *Current Opinion in Obstetrics and Gynecology* 2009; 21:342–347.
12. Brubaker L, Norton PA, Albo ME, et al. Adverse events over two years after retropubic or transobturator midurethral sling surgery: findings from the Trial of Midurethral Slings (TOMUS) study. *Am J Obstet Gynecol* 2011, 205:498.e1-6.
13. Houwing MM, Schulz JA, Flood CG, Baydock S, Rosychuk RJ. A retrospective review of tension-free vaginal tape/transobturator tape procedures done concomitantly with prolapse repair. *J Obstet Gynaecol Can* 2013; 35(4):340-7.

14. Kleeman S, Goldwasser S, Vassallo B, Karram M. Predicting postoperative voiding efficiency after operation for incontinence and prolapse. *Am J Obstet Gynecol* 2002;187:49-52.
15. Miller EA, Amundsen CL, Toh KL, Flynn BJ, Webster GD. Preoperative urodynamic evaluation may predict voiding dysfunction in women undergoing pubovaginal sling. *J Urol* 2003;169:2234-7.
16. Hong B, Park S, Kim HS, Choo MS. Factors predictive of urinary retention after a tension-free vaginal tape procedure for female stress urinary incontinence. *J Urol* 2003;170:852-6.
17. Mahajan ST, Kenton K, Bova DA, et al. Transobturator tape erosion associated with leg pain. *Int Urogynecol J Pelvic Floor Dysfunct.* 17(1): 66-68, 2006.
18. Daneshgari F, Wesley Kong W and Swartz M: Complications of Mid Urethral Slings: Important Outcomes for Future Clinical Trials. *J Urol* 2008; 180, 1890-1897.
19. Barber MD, Gustilo-Ashby AM, Chen CC, Kaplan P, Paraiso MF and Walters MD: Perioperative complications and adverse events of the MONARC transobturator tape, compared with the tension-free vaginal tape. *Am J Obstet Gynecol* 2006; 195: 1820.
20. Abdel-Fattah M, Ramsay I and Pringle S: Lower urinary tract injuries after transobturator tape insertion by different routes: a large retrospective study. *BJOG* 2006; 113: 1377.
21. Griffiths, D., Hofner, K., van Mastrigt, R., Rollema, H., Spangberg, A. and Gleason D: Standardization of terminology of lower urinary tract function: pressure-flow studies of voiding, urethral resistance, and urethral obstruction. International Continence Society Subcommittee on Standardization of Terminology of Pressure-Flow Studies. *Neurourol Urodyn*1997; 16: 1.
22. Akikwala TV, Fleischman N and Nitti VW: Comparison of Diagnostic Criteria for Female Bladder Outlet Obstruction. *J Urol* 2006; 176, 2093-2097,
23. Nager CW, Brubaker L, Litman HJ, Zyczynski HM, Varner RE, Amundsen C, Sirls LT, Norton PA, Arisco AM, Chai TC, et al A randomized trial of urodynamic testing before stress-incontinence surgery. *N Engl J Med* 2012; 24; 366(21):1987-97.
24. Chassange, S., Bernier, P. A., Haab, F., Roehrborn, C. G., Reisch, J. S. and Zimmern, P. E.: Proposed cutoff values to define bladder outlet obstruction in women. *Urology*, 51: 408, 1998.
25. Lemack, G. E. and Zimmern, P. E.: Pressure flow analysis may aid in identifying women with outflow obstruction. *J Urol*,163: 1823, 2000.
26. Defreitas, G. A., Zimmern, P. E., Lemack, G. E. and Shariat, S. F.: Refining diagnosis of anatomic female bladder outlet obstruction: Comparison of pressure flow study parameters in clinically obstructed women with those of normal controls. *Urology*, 64: 675, 2004.
27. Nitti, V. W., Tu, L. M. and Gitlin, J.: Diagnosing bladder outlet obstruction in women. *J Urol*, 161:

1535, 1999.

28. Blaivas, J. G. and Groutz, A.: Bladder outlet obstruction nomogram for women with lower urinary tract symptomatology. *Neurourol Urodyn*, 19: 553, 2000.

Postoperative voiding dysfunction

Treatment and outcome

Christopher Chapple

The Royal Hallamshire Hospital

Sheffield Teaching Hospitals

Sheffield UK

In recent years there has been an increasing use of slings surgery – predominantly using synthetic materials for the treatment of stress urinary incontinence. This has largely replaced the once popular colpo suspension. In those women with stress urinary incontinence there is often very limited bladder contractile power required to empty it. When a significant resistance is introduced into the bladder then inevitably voiding difficulty can result; in addition a proportion of such patients may also experience concomitant storage dysfunction with urgency and urgency incontinence. This presentation will focus on the management of storage dysfunction and will attempt to provide an overview of contemporary practice with reference to contemporary literature.

The first issue is to define what criteria are used to define voiding dysfunction? What residual is significant and at what level of 'retention' should intervention be commenced? Should it be symptomatic? In particular bearing in mind that the term voiding dysfunction is subject to individual interpretation, how common is it? The American Urological Association Stress Urinary Incontinence Clinical Guideline Panel reports a rate of retention for all stress incontinence procedures between 5% to 8% 4 weeks postoperatively [1] It is clear that patients should be adequately counselled about the potential for voiding difficulty preoperatively, but should they be taught intermittent self catheterisation preoperatively?

When considering that clinically significant retention is present, at what time following surgery should intervention be instituted? The timing of intervention still remains controversial. Although the timing of surgical intervention is debatable, contemporary studies have indicated that symptoms that persist beyond 4 weeks after sling surgery rarely resolve on their own [2]. In addition there is a perception that patients who have a prolonged period of voiding difficulty are more likely to be troubled by continuing problems.

What form of intervention should be used? What technique should be used? and what is the likely rate of recurrent incontinence following treatment? Certainly in some patients they may wish to tolerate retention and use intermittent clean catheterisation rather than run the risk of developing recurrent incontinence. The treatment options include early dilation/downward traction on the sling to decrease its tension. Following this, incision of a sling can be used either in the midline under local anaesthetic or laterally. Failing all else then a formal urethrolysis can be carried out. Not surprisingly more extensive procedures carry a greater risk of morbidity including a return of stress urinary incontinence, albeit this is reported to occur in up to approximately 25% of cases. Having said this there will be a few patient with persistent voiding problems, in these patients a repeat urethrolysis can be performed with some reported success.

What about the incidence of urgency and urgency incontinence in 10% of cases overall and increasing in incidence in the presence of obstruction? This can be difficult to treat and may persist even after relief of obstruction.

All of these important clinical questions will be discussed in the light of the available literature.

REFERENCES

1. Leach GE, Dmochowski RR, Appell RA, et al.: Female Stress Urinary Incontinence Clinical Guidelines Panel summary report on surgical management of female stress urinary incontinence. J Urol 1997, 158:875–880.
2. Rosenblum N, Nitti VW: Post-urethral suspension obstruction. Curr Opin Urol 2001, 11:411–416.