Clean Intermittent Catherization in spinal cord injury

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CIC: A brief history of urethral catheterization

- « Emptying the overfilled bladder must have been one of the problems of the mankind since ancient times »

- The Edwin Smith surgical Papyrus
  1550-1500 BC
  Case: 31: « one having a dislocation in a vertebra of his neck, while he is unconscious of his two legs and his two arms, and his urine dribbles. An ailment not to be treated »

- Rufus of Ephesus (first century AD)
  Disease of the kidney and bladder
  A paralytic bladder as from spinal cord injury, should be treated by catheterisation
Intermittent catheterization: history, conceptual and theoretical Basis

• Morton CA 1901 (Fractures of the spine and their treatment) suggested that patients with spinal fractures should empty the bladder by Intermittent catheterization
  – Period: World War I to World War II: tidal drainage, suprapubic catheterization remain the preferred means of managing chronic bladder dysfunction

• Prather: «It is generally agreed that in the management of Spinal Cord Injuries, intermittent catheter drainage is the worst form of treatment that can be used »!
Intermittent catheterization: history, conceptual and theoretical Basis

- But what was the status of the spinal cord injury patients?
  - Fully died 80% in the first few weeks in consequence of infections from bedsores and catheterization...Only those cases survived in which the spinal cord lesion was a partial one (Harvey Cushing 1927)
Intermittent catheterization: history, conceptual and theoretical Basis

• Sir Ludwig Guttmann
• 1° February 1944: opening of the National Spinal Injuries Centre in Stoke Mandeville, UK
  – « From the author’s personal observations it would appear that neither urethral catheterisation (indwelling) nor suprapubic cystostomy had yet proved a safeguard against ascending urinary infection »

• Non touch intermittent catheterization
  – Sterile, by MD, every 6 hours
  – First publication in 1947: decrease of UTI, no urethral stricture, no urethral fistulae
  – Earlier return to micturition
Intermittent catheterization: history, conceptual and theoretical Basis

- **Guttman: Non touch technique**

- 1966: *first results of 11 ans of experience*
- 476 SCI patients
- UTI: 4.2%
- Vesico-ureteric reflux: 4.4%
- Hydronephrosis: 7.4%
- Kidney stones: 1.7%
- Bladder stones: 0.6%
- Urethral fistulae: 0%
Clean Intermittent catheterization: history, conceptual and theoretical Basis

Milestone in Urology

CLEAN, INTERMITTENT SELF-CATHETERIZATION IN THE TREATMENT OF URINARY TRACT DISEASE

JACK LAPIDES, ANANIAS C. DIOKNO, SHERMAN M. SILBER AND BETTE S. LOWE

From the Section of Urology, Department of Surgery, University of Michigan Medical Center, Ann Arbor, Michigan

(Reprinted from J Urol, 107: 458–461, 1972)

• Concept of host resistance: infection is the result of invading microorganisms and host resistance
  – Host resistance is the most important determinant

• Heart of urinary tract infections: bladder distension and high intravesical pressures → bladder ischemia → decrease of host resistance

• « Frequency rather than sterility »
  – First patient: early winter of 1970
Clean Intermittent catheterization: history, conceptual and theoretical Basis

- **Jack Lapides**: *J of Urol* 72, 74, 75
  - The Technique of Self Catheterization:
    - Washing the hands with soap and water
    - **Female patient**:
      - Learning in a modified recumbent position with feet on a table and a mirror in order to visualize the perineum
      - Secund trial: on the toilet seat
      - Catheterization with a 14F clear plastic catheter
      - No sterilizing solution, no lubricant
    - **Male patient**:
      - Sitting position
      - Use of a water soluble lubricant
  - **Both cases**
    - Bladder expression at the end of the catheterization
    - Washing the catheter with the same soapy water
    - Rinsing the inside and outside of the catheter with clear water
    - Carrying the catheter in a dry state in a plastic bag
  - **Every three hours, Diuresis/Day = 1.5L**
Clean Intermittent catheterization: history, conceptual and theoretical Basis

- **Jack Lapides: J of Urol 1975**
  - 216 patients
    - UTI: before self cath 8% of the patients had sterile urine, after 48%
      - Acute pyelonephritis: 1
    - Urethritis: 2
    - Epididymitis: 2
    - Upper tract deterioration: 0
    - Improvement of hydroureteronephrosis in 9/38 with upper tract abnormalities
    - Dramatic improvement of incontinence in association with ACH drugs in UMN lesions

- « We have never seen a more grateful group of patients »
Clean Intermittent catheterization: history, conceptual and theoretical Basis

- Intermittent catheterization and vesical defenses
  - Franck Hinman JR, J of Urol 1977
  - Proof of concept?
  » Constant bacterial count related to residual and catheterized urine and to frequency of catheterization

\[
V^\circ = \frac{V^t}{2^{2t}}
\]

Frequency of catheterization, Hrs

Volume residual urine

Volume per emptying
Clean Intermittent catheterization: conceptual and theoretical Basis and clinical data

• 40 Years of extensive debate in the literature
  – CIC Gold standard: used by more 54% of SCI, and 80% of paraplegics

• Bakke (J of Urol 1993, Br J Urol 1997)
  – Prospective follow-up of 302 patients during 1 year, and 7 years later
  – Predictive factors of UTI
    » Mean catheterization volume ≥ 400 ml
    » Low frequency of catheterization < 4/24H
    » Urine leakage in men
  ▪ Corroborate the brilliant concept of Lapides
Clean Intermittent catheterization

• Which are the goals of urinary management in SCI?
  – To prevent urinary and genital complications
    » Deleterous role of intravesical pressure > 40 cm H20
    » Follow-up
  – To obtain continence if possible
  – To adapt the mode of micturition to the functional and psychological abilities of the patients

• Today, what is the status of SCI people?
  – From Hackler to de Vivo :
    » Urinary tract infections and renal failure are not the number one killer of persons with SCI
    » But still remain a major cause of morbidity (Cardenas 2004)
  – Linear improvement of life expectancy at each following decades
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• Which are the indications of IC in the SCI population?
  – The Acute Phase:
    » Intermittent catheterization is the best mode of drainage
      • Third day post injury
      • Avoid urinary and genital complications
      • Maintain a good bladder capacity and compliance (Weld 2000)
      • Decrease the risk of autonomic dysreflexia associated with ACH drugs
    » By Nurses 6 or 7 times/day
      • Diuresis around 1.5 L
      • Control of frequency-volume chart (recumbent polyuria, nocturnal polyuria)
    » Until definitive choice of micturition
    » During bladder retraining: measurement of post-void residual volume
    » Clean intermittent self catheterization in paraplegic patients once the fracture site is stable

*Guidelines for the urological management of patients with SCI, Abrams P, BJU 2008*
Intermittent catheterization: drainage at the acute phase

- **Zermann 2000**
  - 170 SCI

15 Severe complications (10%) with indwelling urethral catheters:

- Acute Pyelonephritis: 7
- Severe pyogenic cystitis: 3
- Paraurethral abscess: 2
- Urethral fistula: 1
- Urethral stricture: 1
- Hemorrhagic cystitis: 1

-Low rate of complications = intermittent catheterization

Clean Intermittent Catheterization: Indications

- Indications: the chronic phase
  - All patients able to self catheterize are candidates

  » UMNL: Self Intermittent Catheterization associated with the treatment of neurogenic detrusor activity (ACH drugs, botulinum toxin, augmentation cystoplasty) in order to prevent upper tract deterioration and to obtain a continence

  » LMNL: Self intermittent catheterization associated with the surgical treatment of stress incontinence (balloons ACT, aponeurotic slings, artificial sphincter). CIC is preferred to abdominal straining in order to prevent perineal complications.
Clean Intermittent Catheterization/Indications

• **Middle level tetraplegia : C6-C7**
  – Use of combined strategies
    » Continent cystostomies with/without augmentation cystoplasty
  » **Upper limb surgery**
Clean Intermittent Catheterization: the gold standard?

- **Effect on bladder management on urological complications in SCI patients** (Weld J of Urol 2000)
- 316 SCI patients, mean follow-up 18.3 Y
  - 398 complications: indwelling cath = 53.5%, CIC = 27.2%, SPC = 44.4%, spontaneous voiding = 32.4%

**Infectious complications**

- Epididymitis: Urethral cath > Spont Void > CIC > SPC
- Pyelonephritis: Spont Void = CIC > Urethral cath > SPC

**Urethral complications**

- Urethral stricture: Urethral cath > Spont Void > CIC > SPC
- Priurethral abscess: Urethral cath > Spont Void > CIC > SPC
Clean Intermittent Catheterization: the gold standard?

• Weld J of Urol 2000

• Mc Kinley: Long term medical complications after TSCI: Arch Phys Med Rehabil 1999
Clean Intermittent Catheterization and UTI

- Prospective study of 128 SCI patients from the acute phase for 38 months
Clean Intermittent Catheterization and UTI

- Frequency of significant bacteriuria > 60%
  - (Bakke 1993, 94, 97; Perrouin-Verbe 1995)

- Clinical UTI
  - *Risk factors for bacteriuria and clinical UTI in patients treated by CIC (Bakke, J of Urol 1993)*: 302 patients followed 1 year
  - Definition of a clinical infection score from 0 (absence of clinical signs of infection) to 6 (at least 2 Upper UTI)
    - Mean score 2.1
  - *Physical predictors of infection in patients treated with CIC: a prospective 7-year later*
    - The same population: status of UTI the last two weeks
      - 65% No symptoms, 27% one minor symptoms, 13% minor UTI with at least 2 symptoms, 6% severe infectious symptoms

- CIC
  - Low infection rate
  - UTIs more often confined to the lower urinary tract
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- Which complications?
  - Urethral stricture: complication of the long term ≥ 5 Years of CIC
    - PVC catheter
      - Wyndaele (1990): 75 patients, 33 males; Mean duration of CIC 7 Years
        - Urethral stricture = 21%
      - Perrouin-Verbe (1995): 21 males; Mean duration of CIC 9.5 Y
        - Urethral stricture: 19%
    - Hydrophilic catheters
      - Waller (1995): 30 patients, 26 males; Mean duration of CIC 7 years
        - Urethral stricture = 15%
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- Which complications?
  - Epidydimitis
    - CIC
      - Wyndaele (1990) & PVC Catheters: 18%
      - Perrouin-Verbe (1995) & PVC catheters: 28%
      - Waller (1995) & Hydrophilic catheters: 3.8%
    - Indwelling catheter: 30.4% (Bors et Comarr 1971)
    - Varied bladder emptying techniques (Crede, suprapubic taping): 38.5% (Mirsadraee 2003)
    - Strong relationship false passages/urethral stricture and epidydimitis
      - More common for patients with a history of urethral stricture
        - 66.7% versus 25.2% (KU, Spinal Cord 2006)
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• Which recommendations and which optimal technique?
  – Definitions of terms (Cockrane 2008)
    » A sterile technique (NON Touch) = sterile gloves, sterile single use catheters and sterile drainage tray
      • Always sterile (single use) catheters
    » An aseptic technique (No Touch) (EAU 2008) = sterile single use catheters, desinfection of the genitals and use of a disinfecting lubricant
    » A clean technique of IC (Consortium for Spinal Cord Medicine 2006) = clean gloves or no gloves (self catheterization), clean but non sterile cleansing solution, clean receptacle
      • Single use catheter
        – Uncoated PVC catheters
        – Pre-lubricated catheters
        – Hydrophilic catheters
      • Multiple use catheter
        – PVC catheters
Clean Intermittent catheterization

- **Long term Bladder management by intermittent catheterisation in adults and children (Moore et al, Review, Cochrane publication 2008)**
  - Sterile versus clean? Coated versus uncoated? Single use versus multiple use?
  - 14 included Studies
    - Sterile versus Clean: 3 studies
      - *Duffy 1995* (prostate obstruction): sterile versus clean multiple use
      - *King 1992* (58 SCI patients): sterile versus clean multiple uses in hospitalized patients
        - No significant difference in terms of UTIs/bacteriuria
      - *Moore 2006* (36 SCI patients): sterile versus clean single use in hospitalized patients
        - No significant difference
    - Coated versus uncoated:
      - *De Ridder 2005*: 82% (PVC group) versus 64% (Hydrophilic group) had ≥ UTIs (p=0.02)
      - *Vapnek 2003*:
        - No difference in term of UTIs
        - Decrease in the rate was significantly higher in hydrophilic group
      - Short term studies (1-4 days): *Quigley (1993),Day (2003)*: no significant difference
  - Lack of evidence +++
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• Cardenas (Ach Phys Med Rehab) 2009
  – Hydrophilic versus non coated catheters
    » No difference in the number of UTIs, but significant reduced numbers of treated UTIs in the hydrophilic group.

• To summarize, which recommendations?
  – Clean technique according to the principles of Lapides (frequency)
    » Anderson : fivefold incidence of UTIs when CIC is done 3/day versus 6 +++
  – Type of catheter :
    » Male population : Hydrophilic catheters in order to prevent urethral complications and epididymitis
    » Female population : CIC with reused PVC catheters versus hydrophilic?
      • Depending of the presence of genital sensation
      • But also, way of life, environmental factors, functional abilities
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• Which Limits?
  – Catheterization difficulties at the striated sphincter
  – Persistence of incontinence and/or high intravesical pressures despite an appropriate treatment
    » Persistence of incontinence
    » Dependence on caregivers
      • Third party catheterization at home: Major risk of UTIs, (Cardenas 1987)
      • Worst emotional condition (Liu 2010)
      • 4.6 fold higher risk of depression (Oh 2005)
  – CIC is not a suitable procedure for patients who are unable to self-catheterize
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• What about the compliance of the patients?
• Bladder emptying over the years
    » CIC high proportion of continuation
    » 44% switch from indwelling catheter to CIC
  – NSCID (Cameron 2010): 41% CIC to indwelling catheter during follow-up
  – Role of economics factors?
    » of educational interventions?
    » of Follow-up
Clean Intermittent catheterization

• What about the education?
  – Therapeutic Patient Education Program
    » In specialised units (SCI units/ CIC center) (Oh 2006)
      • Training group workshop, video, written material, intensive face to face counselling, self administered tests and follow-up
    » What must be the basic knowledge for the patients?
      • Anatomical and physiological knowledge of the urinary tract
      • Adaptative abilities to medical problems, environmental factors
      • The proper technique with the proper material
    » Evaluation at each visit of follow-up and new training
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• To conclude
  – CIC has been a revolutionary advance and is a safe and efficacious method for the treatment of urinary disorders in SCI population
  – Must be include in the framework of a hollistic management of SCI patients
    » Indications/functional status
    » Regular follow-up
    » Programs of therapeutic education.