ICS Teaching Module: Ambulatory Urodynamic Monitoring

A Digesu, C Gargasole, C Hendricken, M Gore, E Kociancic, V Khullar & P Rosier

Ambulatory Urodynamic Monitoring

Dr. Ersin Köseoğlu

ICS teaching module

- To assist clinicians in performing and interpreting AUM
- This teaching module should be used together with the manuscript: 'ICS teaching module: Ambulatory Urodynamic Monitoring (AUM)'
- This manuscript includes the best available evidence but also contains experts' opinions reported as "eo" if reliable evidence is unavailable
- This module can, only in its complete form, freely be used for teaching purposes

Introduction

- A summary of the published literature on the role of AUM in clinical and research practice.
- Indications
- Technique and Protocol for AUM
- Troubleshooting
- Interpretation of AUM traces
- Advantages and disadvantages of AUM compared to laboratory cystometry (routine saline urodynamics)

Philosophy & Pathophysiology

- AUM has been recognized by the ICS as a useful tool to investigate LUTS in patients with inconclusive urodynamics diagnoses (19% to 44%)

Philosophy & Pathophysiology

ADVANTAGES

- Natural (orthograde) filling of the bladder

- Less embarrassing test since the patients are fully dressed

- The pressure are recorded for several hours (3-4)

- The patients able to leave the urodynamic room

- Increased diagnostic accuracy in the detection of DO

Philosophy & Pathophysiology

DISADVANTAGES

- Time-consuming test

- It requires trained and dedicated personnel

- It requires specialized equipment

- A high rate of abnormal detrusor contractions using AUM in asymptomatic controls

Catheters

- Catheter-mounted microtip transducers:
  silicone-covered braided metal makes them very flexible
  low stiffness and the circumferential configuration
  allow greater patient's mobility
  low incidence of artifacts (eo)

- Fluid-filled catheters: possible but use not yet proven

- Air - charged catheters: possible but use not yet proven

Single use Catheters

- The use of single use catheters would be ideal as:
  - it would reduce the costs
  - save the time needed to reprocess/clean the multi-use electronic microtip transducers catheters

- Although recent studies have shown promising results in performing AUM with water filled catheters (for Pves/Pabd) scientific evidence is still lacking

Pressure sensor systems

- Tiny airtight capsules inserted into the bladder and rectum which then communicate with a portable recorder attached to the body to reduce artifacts

- The clinical use has not been proven & validated yet

Recording systems

- Gaeltec Devices

  - the oldest systems using electronic catheters-mounted microtip transducers

  - large recorder box which is very awkward to carry around

  - Lack of a patient event-marker capability to capture the patient sensation data and timing for urgency, voids, accidents, etc.

Recording systems

- Goby, Laborie Medical or Luna, MMS:

  - Newer systems

  - Small remote control attachment to capture data

  - Compatible with water, air and microtip catheters

Patient preparation

- Information leaflets explaining the test are posted to patients prior to the appointment
- Comfortably full bladder
- A uroflow and a urine analysis are performed
- AUM test can be performed if there are no signs of urine infections (nitrates and leucocytes)
- Wearing comfortable clothes (preferably gown for women)
- Empty bowel if possible

Technique

- Similar to laboratory cystometry
- Catheters are inserted into the bladder and the rectum
- Sufficient catheter length into bladder/rectum
- Catheters should be securely taped adjacent to the anus and external urethral meatus to reduce the risk of catheter's falling out as well as to reduce artifacts
- Transducers set to zero
- The patient can then dress and the catheters can be connected to the AUM recording system

Zero setting: water filled catheters

- Transducers must be set to zero at the atmospheric pressure
- Two three-way taps can be attached to the vesical and rectal transducers
- 10 ml syringe is used to flush fluid through the tubing system to eliminate bubbles from the transducers and catheters
- Transducers and the open end of the three-way tap must be at the same horizontal level of the symphisis pubis after having excluded the syringe by closing the tap where the syringe is attached

Zero setting:
Air-charged & microtip transducers catheters

- Set zero prior to recording
- Before or after insertion into the bladder & rectum
- Not necessarily at the atmospheric pressure

Technique

- Prior to commence recording the patient is asked to cough to check the intravesical, abdominal and subtracted detrusor pressures
- AUM can be started if there is a similar increase of the intravesical and abdominal pressures and the subtracted detrusor pressure does not change
- Any problem must be rectified!

Technique

- Before the patient leaves the urodynamic room it is mandatory to ensure that the patient:

1. Understands and is able to follow instructions

2. Records on a diary all the urinary symptoms reported during AUM test

Since symptoms are compared against the pressures recorded, an accurate recording of symptoms and the times when they occur is essential for the final AUM diagnosis

Technique: recording urine leakage

- Method has not yet been standardized

- This may be recorded by:

- An electronic pad
- A remote control with event marker button
- Completing a urinary symptom diary
- All the above

Instructions to the patient

- To record episodes of urgency, incontinence, pain, voluntary voids, time and volume of fluid intake, feeling of catheter displacement, any provocative maneuvers (running, washing hands, coughing etc)

- How to use the event buttons on the AUM device

- To drink about 200-400 ml/hour or a fluid load up to 1 litre drunk over 30 minutes (unless a fluid load is contraindicated the AUM time would take longer [eo])

Instructions to the patient

- To return to the urodynamic room:
- Every hour to check the system is recording the pressures correctly and subtraction is accurate
- If need to void
- If one of the catheter falls out (if a diagnosis has not be revealed the pressure transducers would need to be re-inserted, re-zeroed and the test will be re-started thus the length of the test will be altered from the suggested standard)
- If the patient needs to defecate the catheter would need to be removed and reinserted accordingly

Quality control assessment

To ensure a good quality control it is important to check the signal quality by:

- Setting each transducer to zero prior to commencing to record the pressures or during the test if needed;
- Ensure that the intravesical/abdominal pressures are similar by asking the patient to cough prior to commencing the test and every hour
- Asking the patient to cough before and after each void when pressure flow studies are recorded (LE 2a)

Quality control assessment

- Ensure that all the catheters are securely taped on the patient's thigh, the catheter's length is reduced to the shortest length possible to avoid accidental displacement during the test

- If filled fluid catheters are used, ensure that there is no air in the system that may affect the quality control

- Provide information to patients advising to attend the appointment with an empty bowel if possible

Analysis and interpretation of AUM trace

- Assessment of the quality of data (signal) recorded:
- Is the trace “active”?
- Is the baseline static or highly variable?
- Are the cough tests regularly present?
- Is the subtraction adequate?

- At the end of the test, hourly or if any problem arises, to reduce the risk of missing or uninterpretable data

- The use of a detailed patient diary or event markers on the newer AUM systems is strongly recommended to improve the analysis of events occurring during AUM (14 eo)

Contraindications

- Poor patient mobility
- Cognitive impairment
- Inability to follow instructions
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- Severe constipation
- Active urinary tract infection
- Medical conditions which limit patient's participation (clinician's discretion)

Recommendations

- AUM is most sensitive for the detection or exclusion of detrusor overactivity compared to laboratory cystometry (LE 2a[16])
- AUM is valuable when all other diagnostic tests have failed to detect the underlying cause of LUTS and/or LUTS do not correlate to laboratory cystometry diagnosis (LE 2a)
- Stress urinary incontinence is better detected by laboratory cystometry than AUM [(15)] (LE1B)
- UTI must be excluded prior to commencing the test

Scientific Evidence

- No scientific evidence demonstrating that routine antibiotic cover before and after the test is needed

- Post procedure broad spectrum antibiotic cover may be considered in patients with:
- Diabetes
- Recurrent urinary tract infections
- High post micturition residual[eo]

- Although there is no scientific evidence supporting the use of routine bowel evacuation agents before AUM test (as they can cause rectal activity and/or abdominal discomfort) an impacted bowel should be avoided
- To date there is no clear LE about AUM role in the assessment of neurogenic LUTS

Conclusions

- AUM is a valuable and effective second line test where laboratory cystometry has failed to give a satisfactory diagnosis (LE2a)
- AUM improves the outcome of continence surgery by unmasking preoperative underlying DO ([eo], unpublished data)
- AUM is a more time consuming test than laboratory cystometry
- AUM requires expertise as well as specialised equipment
- To make the most of its diagnostic capability and to avoid over diagnosis of DO, a detailed record of urinary symptoms during the test is always recommended