EUROPEAN UROLOGY 65 (2014) 389–398

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Platinum Priority – Review – Voiding Dysfunction

Editorial by Karl-Erik Andersson on pp. 399–401 of this issue

Detrusor Underactivity and the Underactive Bladder: A New Clinical Entity? A Review of Current Terminology, Definitions, Epidemiology, Aetiology, and Diagnosis

Nadir I. Osman [a], *Christopher R. Chapple* [a,*], *Paul Abrams* [b], *Roger Dmochowski* [c], *François Haab* [d], *Victor Nitti* [e], *Heinz Koelbl* [f], *Philip van Kerrebroeck* [g], *Alan J. Wein* [h]

[a] *Department of Urology, Royal Hallamshire Hospital, Sheffield, UK;* [b] *Department of Urology, University of Bristol, Bristol, UK;* [c] *Department of Urology, Vanderbilt University Medical Center, Nashville, TN, USA;* [d] *Department of Urology, Hôpital Tenon, Paris, France;* [e] *Department of Urology, NYU Langone Medical Center, New York, NY, USA;* [f] *Department of General Gynaecology and Gynaecologic Oncology, Medical University of Vienna, Vienna, Austria;* [g] *Department of Urology, Maastricht University Medical Centre, Maastricht, The Netherlands;* [h] *Division of Urology, University of Pennsylvania School of Medicine, Philadelphia, PA, USA*

Article info

Article history:
Accepted October 12, 2013
Published online ahead of print on October 26, 2013

Keywords:
Detrusor underactivity
Underactive bladder
Detrusor failure
Chronic urinary retention

Abstract

Context: Detrusor underactivity (DU) is a common cause of lower urinary tract symptoms (LUTS) in both men and women, yet is poorly understood and underresearched.
Objective: To review the current terminology, definitions, and diagnostic criteria in use, along with the epidemiology and aetiology of DU, as a basis for building a consensus on the standardisation of current concepts.
Evidence acquisition: The Medline and Embase databases were searched for original articles and reviews in the English language pertaining to DU. Search terms included *underactive bladder, detrusor underactivity, impaired detrusor contractility, acontractile detrusor, detrusor failure, detrusor areflexia, raised PVR* [postvoid residual], and *urinary retention*. Selected studies were assessed for content relating to DU.
Evidence synthesis: A wide range of terminology is applied in contemporary usage. The only term defined by the standardisation document of the International Continence Society (ICS) in 2002 was the urodynamic term *detrusor underactivity* along with *detrusor acontractility*. The ICS definition provides a framework, considering the urodynamic abnormality of contraction and how this affects voiding; however, this is necessarily limited. DU is present in 9–48% of men and 12–45% of older women undergoing urodynamic evaluation for non-neurogenic LUTS. Multiple aetiologies are implicated, affecting myogenic function and neural control mechanisms, as well as the efferent and afferent innervations. Diagnostic criteria are based on urodynamic approximations relating to bladder contractility such as maximum flow rate and detrusor pressure at maximum flow. Other estimates rely on mathematical formulas to calculate isovolumetric contractility indexes or urodynamic "stop tests." Most methods have major disadvantages or are as yet poorly validated. Contraction strength is only one aspect of bladder voiding function. The others are the speed and persistence of the contraction.
Conclusions: The term *detrusor underactivity* and its associated symptoms and signs remain surrounded by ambiguity and confusion with a lack of accepted terminology, definition, and diagnostic methods and criteria. There is a need to reach a consensus on these aspects to allow standardisation of the literature and the development of optimal management approaches.

* Corresponding author. Royal Hallamshire Hospital, Glossop Road, Sheffield, S102JF, UK.
Tel. +44 784 175 4192; Fax: +44 114 279 7841.
E-mail address: c.r.chapple@sheffield.ac.uk (C.R. Chapple).

0302-2838/$ – see back matter
http://dx.doi.org/10.1016/j.eururo.2013.10.015

1. Introduction

Detrusor underactivity (DU) is a common lower urinary tract dysfunction that is poorly understood and under-researched. Although the International Continence Society (ICS) has defined DU [1], many other terms are used to describe this entity with a variety of definitions in the contemporary literature. The clinical features of impaired bladder emptying (eg, reduced urinary flow rate, raised postvoid residual [PVR]) may arise as a result of DU but may also occur due to bladder outflow obstruction (BOO) (eg, benign prostatic enlargement, urethral stricture). As such it is often difficult to distinguish DU and BOO without invasive pressure flow studies.

In stark contrast to detrusor overactivity (DO) and overactive bladder (OAB) syndrome, DU has received scant attention in the clinical and scientific literature due to a lack of unified terminology, detailed definitions, and accepted diagnostic criteria with the exception of a reduced voiding pressure with failure of the bladder to empty efficiently during a urodynamic pressure-flow study (PFS). Moreover, there is a lack of even basic insights into the underlying aetiopathogenesis, and the absence of efficacious therapies has led to the common perception amongst clinicians that DU with its resultant symptoms is an incurable problem.

This review focuses on the impairment of bladder emptying function due to the inability of the detrusor to contract effectively rather than on BOO. The literature pertaining to terminology, definitions, epidemiology, aetiology, and diagnostic methods in DU is evaluated to help facilitate future consensus building and standardisation.

2. Evidence acquisition

The Medline and Embase databases were searched for reports in English pertaining to DU from 1 January 1950 to 1 January 2013. A wide set of search terms was used including *underactive bladder, detrusor underactivity, bladder underactivity, impaired detrusor contractility, acontractile detrusor, detrusor failure, hypotonic bladder, detrusor areflexia, raised PVR*, and *urinary retention.* Abstracts were screened for relevance to DU and in terms of prevalence data in clinical series of patients undergoing urodynamic evaluation. Original studies, review articles, commentaries, and editorials were included. The full texts of selected studies were assessed for content relating to definitions, terminology, epidemiology, aetiology, and diagnostic methods.

3. Evidence synthesis

3.1. Terminology

There is a lack of high-level evidence relating to terminology in the assessment of detrusor voiding function. Consequently, the validity of the current terms is reviewed and evaluated largely on the basis of logical reasoning and expert opinion.

A variety of terms have been used to describe the nonobstructive impairment of voiding function, referred to here as DU in accordance with ICS terminology and recent recommendations [2]. Other terms used include *impaired detrusor contractility* [3], *underactive bladder* [4], as well as older terms such as *detrusor areflexia* [5], *hypotonic bladder* [6], and *detrusor failure* or *bladder failure* [7]. Although it is agreed that the diagnosis of DU is primarily urodynamic, the plethora of terms reflects a general ambiguity and lack of consensus.

Impaired detrusor contractility, one of the most commonly used terms, implies a deficiency in the contractile properties of the detrusor. This term is inappropriate in several respects. First, a PFS provides only a proxy measure for contractility based on the pressure generated within the bladder to allow flow through a patent bladder outlet. A true change in muscle contractility is defined as altered isometric contraction tension, independent of resting muscle length [8], measured directly using muscle strips. A urodynamic evaluation clearly does not identify which of the individual contributory components (ie, the detrusor muscle or its innervation) is impaired. Impaired detrusor contractility implies a reduction in contraction strength when in fact the problem may be that of a reduced speed or persistence of contraction.

Terms such as *detrusor failure* or *bladder failure* give the impression of an all-or-nothing event, whereas empirical clinical evidence would suggest a continuum of activity and so would not apply to those patients with symptoms and preserved bladder emptying, albeit with underactive detrusor function. Similarly, *detrusor areflexia* as a term reflects the older nomenclature that is the converse of detrusor hyperreflexia, which from a semantic perspective is inappropriate in contemporary usage. The term *hypotonic bladder* also implies a reduction in detrusor tone, a sustained state of contraction that occurs during filling and so is not strictly specific to the voiding phase of bladder function.

DU (or a potential alternative, bladder underactivity) has the advantage of a published urodynamic definition that relates to the abnormalities underlying symptoms. The equivalent in terms of symptoms could be *underactive bladder* (compare DO as the urodynamic term and OAB as the symptom complex). However, the term *underactive bladder*, by virtue of the vagueness of its clinical characterisation based on symptoms, is unlikely to mean as much to patients and clinicians as OAB.

3.2. Definitions

The 2002 ICS standardisation report defines DU as "a contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or failure to achieve complete bladder emptying within a normal time span" [1]. This definition is hampered by the subjective interpretation of what constitutes reduced strength, reduced length of contraction, or prolonged emptying. Nevertheless, the definition provides a useful conceptual framework within which to define the functional abnormality underlying the