Comparison between the scoring of International Index of Erectile Function (IIEF-15) and the results of RigiScan in patients complaining of erectile dysfunction.

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By

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Abstract

The aim of this work is to compare between the International Index of Erectile Function (IIEF-15) erectile domain scores, and the parameters of nocturnal penile tumescence and rigidity (NPTR) testing measured by RigiScan. A total of 50 men, mean age 47.9±10.8 years (range 22-69 y), presenting with erectile dysfunction (ED) were included in this study. All the men were evaluated with the Arabic translation of the IIEF-15, ICI, penile duplex and 2 nights of NPTR monitoring with the RigiScan. According to the IIEF-EF domain scores (that is obtained from 1 st, 2 nd, 3rd, 4 th, 5 th and 15 th questions), patients were divided into three groups: Group I; patients with mild ED (n =15), Group II; patients with moderate ED (n =26), and Group III; patients with severe ED (n = 9). The distribution of the parameters of NPTR testing (Tip RAU and TAU, Base RAU and TAU, Tip maximum rigidity, Base maximum rigidity, number of erections and duration of erections) among the three groups and the correlation with the IIEF-EF domain scores were evaluated. A strong positive significant correlation was observed between the IIEF-EF scores and the parameters of NPTR testing (P value < 0.05). A weak non significant correlation was observed between the IIEF-EF scores and penile duplex parameters (P value > 0.05). Of the 50 men being considered as having ED according to IIEF-EF scores, 4 (8%) had normal EF according to NPTR testing, these 4 patients were considered to have mild ED according to IIEF-EF domain scores. When the IIEF-EF scores were compared with the parameters of NPTR testing, a statistically significant difference was observed among the three groups (P value < 0.05). In conclusion, we observed a significant correlation between the IIEF-EF domain scores and the NPTR parameters. Men reporting moderate or severe ED on the IIEF are more likely to have

abnormal RigiScan results than patients reporting mild ED. In patients with a mild degree of ED, it is important to perform objective testing, a good portion of these patients could be normal and need only reassurance.

Keywords

RigiScan, International Index of Erectile Function, nocturnal penile tumescence and rigidity, erectile dysfunction, penile duplex

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List of abbreviations

ACA :	**anterior commissure , anterior part**
AI :	**arterial insufficiency**
ANOVA:	**one - way analysis of variance**
APR:	**axial penile rigidity**
AV :	**anteroventral nucleus**
AVSS:	**audiovisual Sexual Stimulation**
BCR:	**bulbocavernosus reflex**
BNST:	**bed nucleus of the stria terminalis**
BPH:	**benign prostatic hyperplasia**
CC :	**corpus callosum**
CCP:	**proximal corpus cavernosum**
CSP:	**proximal corpus spongiosum**
CVL :	**cavernosal venous leakage**
DHEA :	**dehydro epiandro sterone**
DICC :	**dynamic infusion cavernosometry and cavernosography**
DPT :	**diurnal penile tumesccnce**
DR :	**dorsal raphé nucleus**
ED :	**erectile dysfunction**
EDV :	**end diastolic velocity**
EEG :	**electroencephalogram**
EF:	**erectile function**
EMG:	**electro myogram**
EOG:	**electro oculogram**
GP:	**globus pallidus**
HgA1C :	**hemoglobin A1C**
IC :	**Ischiocavernosus**
ICI:	**intra corporeal injection**
ICSD:	**International classification of sleep Disorders**
IIEF:	**International Index of Erectile Function**
IML:	**intermediolateral cell column**
IS:	**intercourse satisfaction**
LC:	**locus coeruleus**
LDT:	**laterodorsal tegmental nucleus**
LPOA:	**lateral preoptic area**
LV:	**lateral ventricle**
ML:	**medial lemniscus**
MPOA:	**medial preoptic area**
MS:	**multiple sclerosis**
NIH:	**National Institute of Health**
nPGi:	**nucleus paragigantocellularis**
NPT:	**nocturnal penile tumescence**

NPTR:	**nocturnal penile tumescence and rigidity**
NREM	**non – rapid eye movement**
OF:	**orgasmic function**
OS :	**overall satisfaction**
OT :	**optic tract**
OXY:	**Oxytocin**
PB :	**parabrachial nucleus**
PDE-5 :	**phospho diestrase enzyme – 5**
PDU:	**penile Doppler ultrasonography**
PEP :	**pudendal evoked potential**
PHAL:	**phaseolus vulgaris leukoaglutinin**
PLMS :	**periodic leg movements in sleep**
PSV :	**peak systolic velocity**
PVN:	**paraventricular nucleus**
Py:	**pyramidal tracts**
Qm :	**maintenance flow rate**
R:	**Pearson's correlation**
RAU:	**rigidity activity unit**
REM:	**rapid eye movement**
ROC :	**receiver operating characteristic curve**
SCP :	**superior cerebellar peduncle**
SD :	**sexual desire**
SPN :	**sacral parasympathetic nucleus**
SREs :	**sleep - related erections**
SWS :	**slow wave sleep**
TAU :	**tumescence activity units**
VLPO:	**ventrolateral preoptic nucleus**
VOD :	**veno - occlusive dysfunction**
VSS :	**visual sexual stimulation**
2D:	**two – dimensional**
3V :	**3rd ventricle**
4V :	**4th ventricle**
5 - HT:	**5 hydroxy tryptamine**

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Introduction

Erectile dysfunction (ED) is defined as "consistent or recurrent inability of a man to attain and/or maintain a penile erection sufficient for sexual performance" ***(Jardin et al., 2000).*** It is a major public health problem, which affects the quality life of the patients and their partners ***(Deveci et al., 2008).***

The patient oriented approach to the evaluation and treatment of male erectile dysfunction is the preferred and accepted approach for the majority of men with erectile dysfunction ***(Lue , 1995) .***

Most population-based studies of erectile function rely mainly on responses from self-reported questionnaires, with the IIEF being the most commonly used ***(Yang et al., 2006)***. The fifteen item International Index of Erectile Function (IIEF) questionnaire, introduced in 1997, has been used extensively and is generally accepted as a reliable and reproducible instrument of male erectile function ***(Rosen et al., 1997 & 2002).*** The fifteen items were divided into five domains of sexual function: erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction. A scoring key for each of the sexual function domains was developed and validated ***(Rosen et al., 2002).***

Objective measures of erectile function generally fall into three categories: assessment of vascular integrity, neurophysiological testing and measurements of erectile capacity (i.e.penile dimensions of tumescence and rigidity). The correlation of penile vascular studies with erectile function questionnaire data is inconsistent, as would be expected of a diagnostic test based only on one aspect of erectile physiology ***(Sattar et al ., 1996) .*** Comparison of neurophysiological testing and

erectile function questionnaire data is difficult , because of the myriad tests available ***(Bemelmans et al., 1994; Lefaucheur., 2001; Bleustein et al., 2003) .***

Measures of overall erectile capacity take into account all physiological factors that affect erectile function. These assessments have taken several forms, but the most commonly used is the nocturnal penile tumescence and rigidity measurements performed by the RigiScan ***(Mizuno et al., 2004).***

Aim of work :

The aim of this work is to compare between the International Index of Erectile Function (IIEF-15) erectile domain scores, and the parameters of nocturnal penile tumescence and rigidity (NPTR) testing measured by RigiScan to assess the sufficiency of the IIEF-15 erectile function domain in the diagnosis of ED. This work also aims to test the ability of the NPTR testing parameters to distinguish between patients with different severities of ED by the IIEF erectile function domain.

SLEEP-RELATED ERECTIONS (SRES)

Sleep-related erections (SREs) are naturally occurring, involuntary episodes of penile erections that occur cyclically during sleep in all sexually potent men in close temporal relationship with rapid eye movement (REM) sleep ***(Hirshkowitz et al ., 2005) .***

Sleep-related erections are also widely known as nocturnal penile tumescence (NPT), a term coined by Ismet Karacan who pioneered research in this area ***(Hirshkowitz et al., 2005).*** The term sleep-related erection (SRE) was adopted by the International Classification of Sleep Disorders (ICSD) in the interest of linguistic accuracy ***(Thorpy ., 1990)***.

SRE Neurophysiology

The neural control of SREs remains largely a mystery. This is because an animal model for the study of SRE neurophysiology had not been available ***(Hirshkowitz et al., 2005)***. A technique for chronic penile erection monitoring in freely moving rats has been developed, ***(Giuliano et al., 1994; Schmidt et al., 1995)*** involving pressure monitoring within the erectile tissues with simultaneous electromyography of ischiocavernosus (IC) and bulbospongiosus (BS) muscles. This technique of erection monitoring demonstrated for the first time that rodents exhibit sleep-related erections, ***(Schmidt et al., 1994&1995)*** thus establishing an animal model for SRE research ***(Hirshkowitz et al., 2005) .***

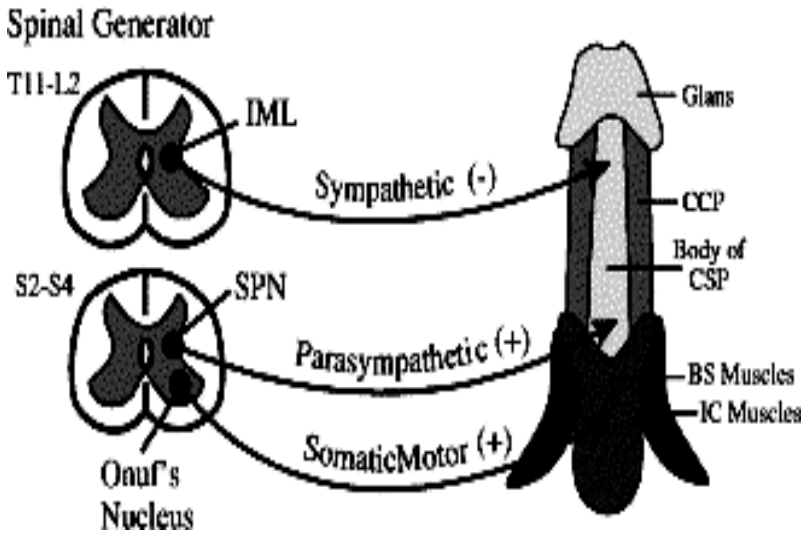
REM-related erections rely on the coordinated control of neural structures spanning virtually all levels of the neuraxis from forebrain to spinal cord ***(Hirshkowitz et al, 2005)***.

Spinal control

Spinal erectile mechanisms are by far the best understood of the central nervous system's control of penile erection. At the level of the spinal cord, the generation of penile erections involves the complex interplay and coordination between parasympathetic, somatic-motor and sympathetic arms of the nervous system ***(Hirshkowitz et al., 2005)*** .

The parasympathetic nervous system plays a proerectile role in generating the relaxation of the supplying arteries and smooth muscles within the erectile tissues, ***(Giuliano et al., 1995)*** allowing blood to enter and engorge the spongy cavernous sinuses. The release of both acetylcholine and nitric oxide are thought to play an essential role in this local vasodilitory process. The parasympathetic preganglionic neurons are located in the sacral parasympathetic nucleus of S2 to S4 spinal cord segments ***(Hirshkowitz et al., 2005).*** Figure 1 shows schematic diagram of the spinal control of penile erections.

Penile rigidity is augmented from a somatic motor component by bursts of the IC and BS muscle which surround and insert onto the proximal corpora cavernosa and corpus spongiosum, respectively ***(Schmidt et al., 1993).*** The motor neurons innervating the IC and BS muscles are located in Onuf 's nucleus in the ventral horn of S2 to S4 spinal cord segments ***(Giuliano et al ., 1995) .***



Figure(1). Schematic diagram of the spinal control of penile erections. Adapted from ***(Hirshkowitz et al., 2005).***

Sympathetic and parasympathetic ganglia and somatic sensory afferents from the penis and surrounding skin are not depicted in the figure. BS, bulbospongiosus muscles; CCP, proximal corpus cavernosa; CSP, proximal corpus spongiosum; IC, ischiocavernosus muscles; IML, intermediolateral cell column; SPN, sacral parasympathetic nucleus.

The sympathetic nervous system plays an important role in ejaculation, detumescence and the maintenance of the flaccid state ***(Giuliano et al., 1995).*** The sympathetic preganglionic neurons are found in the inter-mediolateral cell columns of T11 to L 2 spinal cord segments**.** The release of norepinephrine from sympathetic postganglionic fibers causes vasoconstriction of the supplying arteries and contraction of smooth muscles in the erectile tissues, and thus playing an important role in both detumsecence and the tonic inhibition of erectile activity ***(Hirshkowitz et al., 2005) .***

Although the spinal cord is sufficient to generate reflexive erectile activity, it is not sufficient to generate REM-related erections in the