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Review Article

DIAGNOSTIC TECHNIQUES IN KLAIBYA (ERECTILE DYSFUNCTION)

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ABSTRACT
Klaibya or Erectile dysfunction (ED) is a very common male sexual dysfunction which affects majority of men sometimes in their lives. It has been reported to affect as many as 152 million men worldwide. There are so many etiological factors producing the abnormality which include – physical, chemical, biological, psychosocial causes etc.; to diagnose the cause there are several subjective and objective tools available *viz*. – DSM-IV-TR, diagnostic criteria for ED, IIEF, AVRT, GSR, Duplex USG, Bulbocavernosus reflex, NPT (Nocturnal Penile Tumescence), DICC (Dynamic Infusion Cavernosometery), MRA (Magnetic Resonance Angiography), Digital Subtraction Angiography.
Keywords: Klaibya, IIEF, AVRT, NPT, DICC, MRA.

INTRODUCTION

Male sexual health is described under 'Vajikarana'[1-4], one of the eight major specialities of Ayurveda. The objectives of Vajikarana are to enhance fertility and rejuvenate sexual and reproductive energy in men[2,3,10,11]. Also known as 'Vrishya Chikitsa'[5,6]; Vajikarana is a therapy that makes a man sexually strong like a horse and enables him to copulate satisfactorily with his partner[5-8]. Although Vajikarana focuses mainly on the reproduction of healthy progeny for the creation of a better society, it also describes various sexual and reproductive diseases viz. Klaibya or Erectile dysfunction, premature ejaculation and Bandhyatva or Infertility[2,3,4,9].

Klaibya or Erectile dysfunction (ED) is one of most prominent complaint concerning sexual activity has been reported to affect as many as 152 million men worldwide. Klaibya or Erectile dysfunction (ED) is defined as the recurrent or persistent inability to attain and/or maintain an erection sufficient for satisfactory sexual activity. Although Klaibya or ED is usually considered a benign disorder, may have a major impact on the quality of life of not only the man affected, But also their sexual partners.

Several reports reveal that psychological disturbances such as stress, anxiety, guilt, depression, low self esteem, conflicts between partners, performance anxiety etc. cause 10% to 20% of ED cases[12,14-17]. Other possible causes include organic pathological conditions – damage to the nerves, arteries, smooth muscles and fibrous tissues; diseases – Diabetes mellitus, Hypertension, Chronic alcoholism, Multiple sclerosis, Atherosclerosis, Smoking being overweight; and certain medications[16-18,23,24]. About 8 of the 12 most commonly prescribed medications list impotence as a side effect and about 25% of the ED cases are due to medications viz. Antidepressants (particularly SSRI) diuretics (Thiazide diuretics and spironolactone), Sympathetic blockers (Clonidine, guanethidine, methyldopa), Ketoconazole, cimetidine and β-blockers[18-22].

Diagnostic techniques/tools

Subjective techniques:

International Index of Erectile function. (IIEF)[25],
DSM-IV TR diagnostic criteria for ED[14].

Objective Techniques:

Audio-visual Reaction Time (AVRT)[19,20],
Galvanic Skin Resistance (GSR)[21,22].

Subjective Techniques

International Index Of Erectile Function (IIEF)[25]

It is a questionnaire having 15 items as

1.	Over the past 4 weeks, how often were you able to get an erection during sexual activity?
	No sexual activity
	Almost always or always
	Most times (much more than half the lirt)
	Sometimes (about half the time)
	A few times (much less than half the tine)
	Almost never or never

2.	Over the past 4 weeks, when you had erections with sexual stimulation, how often were your erections hard enough for penetration?
	No sexual stimulation
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
Questions 3,4 and 5 will ask about erections you may have had during sexual intercourse.	
3.	Over the past 4 weeks, when you attented sexual intercourse, how often were you able to penetrate (enter) your partner?
	Did not attempt intercourse
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
4.	Over the past 4 weeks, during sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?
	Did not attempt intercourse
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
5.	Over the past 4 weeks, during sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?
	Did not attempt intercourse
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
6.	Over the past 4 weeks, how many times have you attempted sexual intercourse?

	No attempts
	1-2 attempts
	3-4 attempts
	5-6 attempts
	7-10 attempts
	11 or more attempts

7.	Over the past 4 weeks, when you attempted sexual intercourse how often was it satisfactory for you?
	Did not attempt intercourse
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
8.	Over the past 4 weeks, how much have you enjoyed sexual intercourse?
	No intercourse
	Very highly enjoyable
	Highly enjoyable
	Fairly enjoyable
	Not very enjoyable
	Not enjoyable
9.	Over the past 4 weeks, when you had sexual stimulation or intercourse how often did you ejaculate?
	Did not attempt intercourse
	Almost always or always
	Most times (more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
10.	Over the past 4 weeks, when you had sexual stimulation or intercourse how often did you have the feeling of orgasm or climax (with or without ejaculation)?
	No sexual stimulation or intercourse
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never
Questions 11 and 12 ask about sexual desire. Let's define sexual desire as a feeling that may include wanting to have a sexual experience (for example, masturbation or intercourse), thinking about having sex or feeling frustrated due to a lack of sex	
11.	Over the past 4 weeks, how often have you felt sexual desire?
	Almost always or always
	Most times (much more than half the time)
	Sometimes (about half the time)
	A few times (much less than half the time)
	Almost never or never

12.	Over the past 4 weeks, how would you rate your level of sexual desire?
	Very high
	High
	Moderate
	Low
	Very low or none at all
13.	Over the past 4 weeks, how satisfied have you been with you overall sex life?
	Very satisfied
	Moderately satisfied
	About equally satisfied and dissatisfied
	Moderately dissatisfied
	Very dissatisfied
14.	Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?
	Very satisfied
	Moderately satisfied
	About equally satisfied and dissatisfied
	Moderately dissatisfied
	Very dissatisfied
15.	Over the past 4 weeks, how do you rate your confidence that you can get and keep your erection?
	Very high
	High
	Moderate
	Low
	Very low

Domain	Items	Range	Max Score
Erectile Function	1,2,3,4,5,15	0-5	30
Orgasmic Function	9,10	0-5	10
Sexual Desire	11,12	0-5	10
Intercourse Satisfaction	6,7,8	0-5	15
Overall Satisfaction	13,14	0-5	10

International Index of Erectile Function Questionnaire (IIEF)

I.	Erectile function total scores can be interpreted as follows:	
	Score	Interpretation
	0-6	Severe dysfunction
	7-12	Moderate dysfunction
	13-18	Mild to rmderate dysfunction
	19-24	Mild dysfunction
	25-30	No dysfunction

II.	Orgasmic function total scores can be interpreted as follows:	
	Score	Interpretation
	0-2	Severe dysfunction
	3-4	Moderate dysfunction
	5-6	Mild to moderate dysfunction
	7-6	Mild dysfunction
	9-10	No dysfunction
III.	Sexual desire total scores can be interpreted as follows:	
	Score	Interpretation
	0-2	Severe dysfunction
	3-4	Moderate dysfunction
	5-6	Mild to moderate dysfunction
	7-8	Mild dysfunction
	9-10	No dysfunction
IV.	Intercourse satisfaction total scores can be interpreted as follows:	
	Score	Interpretation
	0-3	Severe dysfunction
	4-6	Moderate dysfunction
	7-9	Mild to moderate dysfunction
	10-12	Mild dysfunction
	13-15	No dysfunction
V.	Overall satisfaction total scores can be interpreted as follows:	
	Score	Interpretation
	0-2	Severe dysfunction
	3-4	Moderate dysfunction
	5-6	Mild to moderate dysfunction
	7-8	Mild dysfunction
	9-10	No dysfunction

DSM–IV- TR Diagnostic Criteria For Male Erectile Disorder[14]

Diagnostic Criteria for Male Erectile Disorder

A. Persistent or recurrent inability to attain, or to maintain until completion of the sexual activity an adequate erection.
B. The disturbance causes marked distress or interpersonal difficulty.
C. The erectile dysfunction is not better accounted for by another Axis I disorder (other than a sexual dysfunction) and is not due exclusively to the direct physiological effects of a substance (e.g. a drug of abuse, a medication) or a general medical condition.

Specify type
- Lifelong type
- Acquired type

Specify type
- Generalized type
- Situational type

Specify
- Due to psychological factors
- Due to combined factors

OBJECTIVE TECHNIQUES

Audio Visual Reaction Timer (AVRT)[19,20]

It is an electronic device by which psychiatrists can evaluate the average time taken by a subject (person) in giving response to a stimulus – Audio or Visual.

Kinds of Reaction Time Experiments

Psychologists have named 3 basic kinds of reaction time experiments (Luce, 1986; Welford, 1980) –

a) Simple reaction time experiment – In this, there is only one stimulus and one response. 'X' at a known location, 'spot the dot', and 'reaction to sound' all measure simple reaction time.

b) Recognition reaction time experiment – In this, there are some stimuli that should be responded to (the 'memory set') and others that should get no response (the 'distractor set'). There is only one correct response. 'Symbol recognition' and 'tone recognition' are both recognition experiments.

c) Choice reaction time experiment – In this, the user must give response that corresponds to the stimulus, such as pressing a key according to a letter if the letter appears on the screen.

Mean reaction Time

For about 120 yrs, the accepted figures for mean simple reaction time for college-age individuals have been about 190 ms (0.19 sec) for light stimuli and about 160 ms (0.16 sec) for sound stimuli (Galton, 1899; Fieandt et al., 1986; Welford, 1980; Brebner and Welford, 1980).

Types of Stimuli

Many researchers have confirmed that reaction to sound is faster than reaction to light with mean auditory reaction times being 140-160 msec and visual reaction time being 180-200 msec (Galton, 1899; Woodworth and Schlosberg, 1954; Welford, 1980; Brebner and Welford, 1980).

Perhaps this is because an auditory stimulus takes only 8-10 sec. to reach the brain (Kemp et al. 1973) but a visual stimulus takes 20-40 msec (Marshall et al., 1943).

Factors Influencing Reaction Time

1) Stimulus Intensity - Froeberg (1907) found that visual stimuli that are longer in duration elicit faster reaction times, and Wells (1913) got the same result for auditory timuli.

Pieron (1920) and Luce (1986) reported that the weaker the stimulus (such as a very faint light) is, the longer is the reaction time. However, after the stimulus gets to a certain strength, reaction time becomes constant.

2) Arousal – 'Arousal' or 'state of attention'. Reaction time is fastest with an intermediate level of arousal, and deteriorates when the subject is either too relaxed or too tense. (Welford, 1980; Broadbent, 1971; Freeman, 1933) i.e. reaction time responds to arousal as follows –

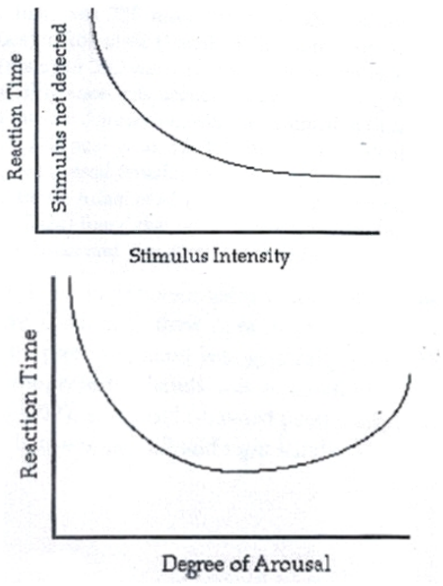


Diagram - Degree of Arousal

3) Age – Reaction time shortens from infancy into the late 20s, then increases slowly until the 50s and 60s, and then lengthens faster as the person gets into his 70s and beyond (Welford, 1977; Jevas and Yan, 2001; Luchies et al., 2002; Rose et al., 2002).
4) Gender – Males have faster reaction time than females (Noble et al. 1964; Welford, 1980; Adam et al., 1999; Dane and Erzurumlogoghu, 2003).
5) Fatigue – Welford (1968, 1980) found that reaction time gets slower when subject is fatigued – mental fatigue, specially sleepiness, has the greatest effect.
6) Fasting – Three days without food does not decrease reaction time, although it does impair capacity to do work (Gutierrez et al., 2001).
7) Breathing cycle – Buchsbaum and Calloway (1965) found that reaction time was faster when the stimulus occurred during expiration.
8) Personality type – Brebner (1980) found that extroverted personality types had faster reaction times, and Welford (1980) and Nettel Back (1973) said that anxious personality types had faster reaction time.

(2) Galvanic Skin Response (GSR)[21,22]

The GSR instrument measures skin conductivity from the fingers and/or palms. An often misunderstood and difficult technique, GSR has gone through many phases of interest and rejection since the early 1900's. It has been used in important research on anxiety and stress levels (Fenz and Epstein, 1967) and it has been a part of lie detection (Raskin, 73).

Physiology

Easily measured and relatively reliable, GSR has been used as an index for those who need some measurable parameter of a person's internal 'state'. The GSR reflects sweat gland activity and changes in the sympathetic nervous system and measurement variables measured from the palm or finger tips, there are changes in the relative conductance of a small electrical current between the electrodes. The activity of the sweat glands in response to sympathetic nervous stimulation (Increased sympathetic stimulation) results in an increase in the level of conductance. Fear, anger, startle response and sexual feelings are all among the emotions which may produced similar GSR responses.

By virtue of GSR autonomic nervous system activity causes a change in the skin's conductivity. The overall degree of arousal of the hemispheres, and indeed the whole brain, is shown by the readings of the GSR psychomotor, which does not differentiate between the hemispheres, or between cortical and primitive brain responses. Higher arousals will almost instantaneously (0.2-0.5 sec) cause a fall in skin resistance, reduced arousal will cause a rise in skin resistance. The level of brain arousal affects emotional state and fortuitously this affects skin resistance – a symptom convenient to measure through two electrodes in contact with the skin, across any two points on the body.

Interpretation

Many studies have confirmed that GSR depends upon a number of factors viz., gender, race, age, personality type etc. but normally the clinical interpretation by seeing the GSR values can be summarized as –

GSR Values	Interpretation
$\leq$ 300 kΩ	Very high arousal of brain
301 – 600 kΩ	Moderate arousal of brain
601 – 900 kΩ	Low arousal of brain
> 900 kΩ	Relaxed /Calm state of brain

(3) Duplex USG[13,15,23]

Duplex USG (i.e. duplex grey scale/color ultrasonography, duplex Doppler ultrasound) is used to identify men who have marked arterial insufficiency as the major cause of their impotence. It is recommended when the penile response to pharmacotesting is suboptimal or equivocal. Duplex USG entails high-resolution ultrasonography with pulsed Doppler blood flow analysis to evaluate the penile arterial status. An injected vasodilator drug (e.g. papaverine HCl, Phentolamine mesylate, PGE_1) is given prior to the test to enhance assessment of arterial or venous insufficiency. Real time spatial visualization measures blood velocity patterns in vessels.

There is evidence that due to anxiety some men with normal vascular function may have falsely abnormal duplex USG results because of suppression of response to pharmacological stimulation. An abnormal duplex USG should be interpreted cautiously if there is evidence of psychogenic impotence.

(4) Penile Nerve Function[12]

Tests like bulbocavernosus reflex test are used to determine if there is sufficient nerve sensation in the penis. The clinician squeezes the glans of penis which immediately causes the anus to contract if nerve function is normal. A physician measures the latency between squeeze and contraction by observing the anal sphincter or by feeling it with a gloved finger inserted past the anus.

(5) Dynamic Infusion Cavernosometry[15,17,23]

Dynamic infusion cavernosometry and cavernosography (DICC) is a procedure that involves four phases to evaluate the flow of blood and pressure functions of penis. The test assesses the integrity of arterial and venous circulatory systems of the penis during an erection. DICC is invasive, requiring two needles to remain in the penis for saline infusion and pressure recording. Local anaesthesia and an intracavernosal injection of a vasoactive drug are given prior to initiation. This procedure has primarily been reserved for individuals considering the option of vein ligation with or without arterial bypass.

(6) Penile Biothesiometry[12,15,16,17]

The Biothesiometer uses a fixed frequency variable amplitude to measure the sensory perception threshold of the penis. The test evaluates the afferent somatic dorsal path way. Penile biothesiometry is indicated when if any of the following criteria are met.

(a) Nocturnal penile tumescence testing suggests sensory neuropathy due to organic impotence or
(b) History indicates sensory neuropathy or
(c) Complaint of retarded ejaculation.

(7) Nocturnal Penile Tumescence (NPT) testing[12,13,15]

NPT is a non invasive, portable technique that electronically monitors the frequency, rigidity, and/or circumferential changes of erections during REM sleep. An absence of erection indicates a probable organic etiology. The Rigi Scan test measures both penile tumescence and rigidity on a continuous basis. The device consists of two loops surrounding the penis that are attached to a small computer with memory capacity. The strain gauge test measures changes in penile circumference. An elastic loop containing a conductive material like mercury is placed around the shaft of the penis. An increase in circumference causes a stretching of the loop and a change in electrical signal; which is recorded on the monitor.

NPT is indicated if any of the following criteria are met.

(a) The individual reports a complete absence of erections.
(b) ED is suspected to be primarily psychogenic in origin.

(8) Corpus Cavernosometry[12,15-21]

Cavernosography measurement of the vascular pressure in the corpus cavernosum. Saline is infused under pressure into the corpus cavernosum with a butterfly needle and the flow rate needed to maintain an erection indicates the degree of venous leakage; the leaking veins responsible may be visualized by infusing a mixture of saline and X-ray contrast medium and performing a cavernosogram (Dawson and Whitefield, 1996).

(9) MRA (Magnetic Resonance Angiography)[16,17,23]

Similar to MRI, uses magnetic fields and radio waves to provide detailed images of blood vessels. The contrast agent being injected provides information regarding blood supply and vascular anomalies.

(10) Digital Subtraction Angiography (DSA)[17,23]

In DSA, the images are acquired digitally the computer creates a mask from lower-contrast x-rays of the same area and digitally isolates the blood vessels (this is done manually through darkroom masking with traditionally angiography).

CONCLUSION

Overall if we see the aetiology behind the Klaibya or erectile dysfunction, we find that the causes of klaibya are of various kinds viz. psychological, organic, metabolic etc. Based on the causes the different investigative / diagnostic techniques are developed; although their clinical use may be limited on certain instances; but it helps a lot to know the inherent cause of the disease and to plan the appropriate management accordingly.

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