Is Erectile Dysfunction the New Penile Angina?

Nick Gerning
General Cardiologist
Interventional Cardiologist
Definition-Potency

“the ability to initiate, sustain and successfully conclude the act of sexual intercourse to the satisfaction of the male-
Leonard Simpson, 1950
ED: Definition

The old understanding

ED *is the inability to attain and/or maintain penile erection sufficient for satisfactory sexual performance*

— *National Institutes of Health*

A new appreciation

ED *is the inability to attain and/or maintain penile erection sufficient for satisfactory sexual performance*

— *National Institutes of Health*
ED: Degrees of severity

Degrees of ED in men and its effect on sex life

<table>
<thead>
<tr>
<th></th>
<th>No ED</th>
<th>Mild ED</th>
<th>Moderate ED</th>
<th>Severe ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trouble getting an erection (%)</td>
<td>5</td>
<td>50</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Full erections (%)</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Satisfaction with partner</td>
<td>1.3</td>
<td>2.2</td>
<td>3.2</td>
<td>3.7</td>
</tr>
</tbody>
</table>

1 = extremely satisfied, 5 = extremely dissatisfied

## Sexual Health Inventory for Men

Patient’s Name ............................................. Date of Evaluation ..................................

### Patient Instructions

Sexual health is an important part of an individual’s overall physical and emotional well-being. Erectile dysfunction, also known as impotence, is a very common medical condition affecting sexual health. Fortunately, there is a range of treatment options for erectile dysfunction. This questionnaire is designed to help your doctor identify if you may be experiencing erectile dysfunction.

Each question has several possible responses. Circle the number of the response that best describes your own situation. Please be sure that you select one and only one response for each question.

### Over the past 6 months:

<table>
<thead>
<tr>
<th>Question</th>
<th>Very low</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do you rate your confidence that you could get and keep an erection?</td>
<td>No sexual activity</td>
<td>Almost never or never</td>
<td>A few times (much less than half the time)</td>
<td>Sometimes (about half the time)</td>
<td>Most times (much more than half the time)</td>
</tr>
<tr>
<td>2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration (entering your partner)?</td>
<td>Did not attempt intercourse</td>
<td>Almost never or never</td>
<td>A few times (much less than half the time)</td>
<td>Sometimes (about half the time)</td>
<td>Most times (much more than half the time)</td>
</tr>
<tr>
<td>3. During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?</td>
<td>Did not attempt intercourse</td>
<td>Extremely difficult</td>
<td>Very difficult</td>
<td>Difficult</td>
<td>Slightly difficult</td>
</tr>
<tr>
<td>4. During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?</td>
<td>Did not attempt intercourse</td>
<td>Almost never or never</td>
<td>A few times (much less than half the time)</td>
<td>Sometimes (about half the time)</td>
<td>Most times (much more than half the time)</td>
</tr>
<tr>
<td>5. When you attempted sexual intercourse, how often was it satisfactory for you?</td>
<td>Did not attempt intercourse</td>
<td>Almost never or never</td>
<td>A few times (much less than half the time)</td>
<td>Sometimes (about half the time)</td>
<td>Most times (much more than half the time)</td>
</tr>
</tbody>
</table>

**SCORE**

Add the numbers corresponding to questions 1-5. If your score is 21 or less, you may be showing signs of erectile dysfunction and may want to speak with your doctor.
ED: Epidemiology

In the UK over 13% of men currently experience erection problems\(^1\)

ED affects as many as 50% of men between the ages of 40 and 70\(^2\)

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ED and CV risk

DM or ↑BP - X4 incidence of complete ED

- Myocardial infarction (50-70%)
- Untreated hypertension 17%
- Treated hypertension 25%
Diabetes and ED Prevalence

- 30-39yrs  25%
- 50-59yrs  54%
- >80yrs    100%

*Rubin and Babbot (O&G), JAMA1958*
Audit to review the need of an Erectile Dysfunction Clinic for Cardiac Patients

March 2008
Cardiac-ED audit

A questionnaire was sent anonymously to 50 Cardiac rehabilitation patients under the age of 70 from Cardiff and Vale.

30 returned.

IIEF

- **Confidence** in achieving and maintaining an erection
- How **often** were erections hard enough for penetration
- How often were you able to **maintain** the erection after you had penetrated your partner
- How difficult was it to maintain an erection to **completion** of intercourse
- When attempted sexual intercourse, how often was it **satisfactory** for you.
## Results

<table>
<thead>
<tr>
<th>Score (max-25)</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 and over</td>
<td>12</td>
</tr>
<tr>
<td>15 to 21</td>
<td>5</td>
</tr>
<tr>
<td>15 and below</td>
<td>13</td>
</tr>
</tbody>
</table>

**18 patients (60%)-ED**

From this small audit, it highlights the need for a specific EC clinic for cardiac patients.
a common problem

how do you get it?

What are the hard facts!
Major Causes of Erectile Dysfunction

- Diabetes Mellitus: 40%
- Vascular Disease: 30%
- Radical Surgery: 13%
- Spinal Cord Injury: 8%
- Endocrine disorders: 6%
- Multiple sclerosis: 3%
- Other: 6%
ED: Pathophysiology

Fig 1. Structural components of the penis

Cross section
Dorsal

- Lacunar spaces
- Corpora cavernosa
- Tunica albuginea of corpus cavernosum
- Buck’s fascia
- Corpus spongiosum
- Urethra
- Tunica albuginea of corpus spongiosum

Ventral

Fig 2. Plaque formation in an artery

Healthy artery
- Adventitia
- Endothelium
- Media

Obstructed artery
- Cholesterol-rich atherosclerotic plaque
Endothelium-Dependent Vasodilation

*Brachial artery response to 5-minute wrist cuff occlusion and release; % dilation from baseline to 60 seconds after cuff release ($P=.05$); significant increase in flow-mediated vasodilation of normal control subjects compared with ED over entire curve ($P=.014$).

Erectile dysfunction: Pathophysiological mechanisms pointing to underlying cardiovascular disease

1. ED is associated with increased inflammatory and endothelial-prothrombotic activation in men with or without CAD.

2. In men with ED only, inflammatory and prothrombotic activation is almost similar compared with men with CAD only.

3. For most markers, ED confers an incremental unfavorable impact when combined with CAD.

Vlachopoulos C, et al. ESC 2006
Risk Factors

Coronary Heart Disease
- Smoking
- Blood Pressure
- Cholesterol
- Diabetes

Erectile Dysfunction
- Smoking
- Blood Pressure
- Cholesterol
- Diabetes

Endothelial Dysfunction - the common denominator

H Solomon, J W Man, G Jackson
Heart 2003;89:251-254
What are the implications?

- ED = ED
- Same risk factor profile
- How does ED relate to CVD?
Is ED a marker for silent cardiovascular disease?

Can we use ED as a means of detecting cardiovascular disease?
Degree of ED & Extent of CAD

- Ease of achieving erections
- Firmness of erections
- Frequency of erections

Erection score

2-3 vessel disease
1 vessel disease

The Penile Stress Test: A window to the hearts of Man? Adapted from Priztker Circulation 2000;100:P3751

50 Men with ED
Asymptomatic for CAD

28 Positive ETT

20 Coronary Angiography

6 men severe CAD
7 men moderate 2-vessel CAD
7 men significant 1-vessel CAD
ED and Coronary Plaque Burden

- 132 men attending Coronary Angiography
- Gensini score – used to assess plaque burden on Angiography
- IIEF score (prior/after CAD Dx)
- Linear regression analysis – Gensini Score vs IIEF score

Solomon et al, AJC 2003:19;230-1
ED and Coronary Plaque Burden

- 65% scored <21 on IIEF
- 58% ED before CAD Dx
- 30% had 1vd; 21% had 2vd; 27% had 3vd
- IIEF Score correlated with Gensini Score
  \[ r = 0.44; \ p<0.001 \]
Male Cardiovascular Health Clinic

- 74 men ED and CAD, no symptoms of PVD
- USS carotid and peripheral arteries
- 50% had significant PVD

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ED is an important marker of all vascular disease

Solomon et al
Am J Cardiol 2003;91:230-1
Erectile dysfunction and probability to develop CAD

10-year coronary risk according to the presence and severity of ED

2561 men without a history of CAD

International Index of Erectile Function-5 questionnaire (IIEF5) to assess prevalence and severity of ED.

Moderate to severe ED, but not mild ED is associated with a considerably increased risk for CAD within 10 years.

Ponholzer A. et al. Eur Urology 2005
Conclusion

“These data could serve as a basis for preventing life-threatening events by risk factor management and lifestyle modification in men with ED”

Ponholzer A et al  *Eur Urol* 2005;48:512-8
Improve your sex life and save your life!

Prof Julian Halcox
Western Mail - Oct 20, 2008
Relationship between erectile dysfunction and silent myocardial ischemia in apparently uncomplicated type 2 diabetic patients

- Is ED associated with asymptomatic CAD in type 2 diabetics?
  - 133 diabetic men silent CAD (angiography)
  - 127 diabetic men no evidence CAD (non-invasive assessment)

Gazzaruso C et al
_Circulation_ 2004;110:22-6
Findings

• ED present in 34% CAD
• ED present in 5% No CAD
• ED independently predicted CAD

• ED marker of silent CAD in type 2 diabetes
• Should you do ETT on DM pts with ED?
ED Prevalence, Time of Onset in 300 consecutive men with acute chest pain and CAD

- Mean age 63 years
- ED prevalence -50%
- ED before CAD symptoms - 67%
- Mean time interval ED to CAD 3 years

Montorsi et al
*Eur Urol* 2003;44:360-5
## Artery size and Atherothrombosis

<table>
<thead>
<tr>
<th>Artery</th>
<th>Size (mm)</th>
<th>Clinical Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penile</td>
<td>1-2</td>
<td>ED</td>
</tr>
<tr>
<td>Coronary</td>
<td>3-4</td>
<td>CAD</td>
</tr>
<tr>
<td>Carotid</td>
<td>5-7</td>
<td>TIA/Stroke</td>
</tr>
<tr>
<td>Femoral</td>
<td>6-8</td>
<td>Claudication</td>
</tr>
</tbody>
</table>

Montorsi et al *Eur Urol* 2003; 44:352-4
ED as a marker of CV disease

In 93% of patients with ED and established coronary artery disease (CAD), ED came before CAD symptoms with a mean time interval of 2 years\(^1\)

Plaque burden in penile arteries can lead to ED symptoms before symptoms occur in coronary, femoral or carotid circulations\(^2\)

Early ED detection could therefore potentially mean time to prevent cardiac events\(^3\)

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What do we Accept?

“The recognition of ED as a warning sign of silent vascular disease has led to the concept that a man with ED and no cardiac symptoms is a cardiac (or vascular) patient until proven otherwise.”

We can justify classifying ED as another form of secondary prevention meriting aggressive risk reduction.

We can use ED as a means of preventing a cardiovascular event?

Sarah Kennedy-radio2
How should we manage ED?
**Endothelial Function**

**Impaired by:**
- Hyperlipidaemia
- Hypertension
- Diabetes
- Atheroma
- Smoking
- Heart Failure
- Post menopause
- Age

**Improved by:**
- Lipid Lowering
- Smoking Cessation
- Exercise
- ACE Inhibitors
- ARB’s
- L-arginine
- Vitamin C
- Glycaemic control
ED treatment

Oral
- Sildenafil
- Vardenafil
- Tadalafil

Non-oral
- Intracavernosal injection
- Intraurethral device
- Vacuum devices
- Implants
- Surgery

74% of treatment-naïve patients opt for oral treatment over other options\textsuperscript{1,2}

PDE-5 inhibitors: site of action

Nitric oxide-cGMP pathway

Sexual stimulation → Nitric oxide

Nitric oxide → Guanylate cyclase

Guanylate cyclase → cGMP

cGMP → Blood vessels in penis expand

Blood vessels in penis expand → ERECTION

Blockade of PDE5 → PDE5

GTP → GTP

GMP → GMP

Andersson KE et al. Physiol Rev. 1995; 75: 191-236
Evolution in the Understanding of CVD

Traditional CVD Perspective

Global CV Risk Perspective

Blood Pressure
Lipids
Diabetes

ED is part of the global risk perspective