Session 4: Testosterone Replacement Therapy: Controversies and Answers

Testosterone Update: Facts, Myths, Reality – Dr Guay

Identification and Evaluation of the At-Risk Patient – Dr Miner

Learning Objectives

1. Identify the signs and symptoms of hypogonadism and their clinical presentation.
2. Identify the role of hypogonadism in diabetes, obesity, metabolic syndrome, and cardiovascular disease.
3. Select options available to effectively treat hypogonadism.
4. Implement monitoring strategies for patients on testosterone replacement therapy.

Faculty

Martin Miner, MD
Chief of Primary Care and Community Medicine
The Miriam Hospital
Clinical Associate Professor of Family Medicine and Urology
Warren Alpert Medical School
Brown University
Providence, Rhode Island

Martin Miner, MD, clinical associate professor of family medicine and urology at Warren Alpert Medical School in Providence, Rhode Island, has practiced preventive and primary care medicine for more than 28 years and is currently chief of family and community medicine at The Miriam Hospital. He is the author of more than 75 publications in the areas of erectile dysfunction and cardiovascular disease, benign prostatic hyperplasia and lower urinary tract symptoms in reference to male sexuality, and hormonal replacement therapy in men. Dr Miner is president-elect of the American Society for Men’s Health, associate editor of the Journal of Men’s Health, and serves on multiple journal boards and reviews for several publications. He is currently active in several research studies on men’s health, and was the recipient of the Dean’s Teaching Excellence Award in 2003 and 2007.

André T. Guay, MD, FACP, FACE
Tufts University School of Medicine
Boston, Massachusetts

Director, Center for Sexual Function/Endocrinology
Lahey Clinic Northshore
Peabody, Massachusetts

André T. Guay, MD, founder and director of the Center for Sexual Function at Lahey Clinic Northshore in Peabody, Massachusetts, earned his medical degree from the New Jersey College of Medicine and Dentistry of New Jersey in Newark, then served an internship and residency in internal medicine at Saint Vincent Hospital in Worcester, Massachusetts. He continued with specialty training in endocrinology and metabolism at the Mayo Clinic in Rochester, Minnesota. Beginning as a staff physician at the Naval Medical Center in Portsmouth, Virginia, Dr Guay advanced to head of the division of endocrinology. He is affiliated with Tufts Medical School, Boston, Massachusetts, as well as serving as senior staff physician in the department of endocrinology at the Lahey Clinic Medical Center in Burlington, Massachusetts.

Research interests span male infertility and sexual dysfunction to the relationship of breast cancer and androgens in women, with a current concentration on male and female testosterone deficiency. His numerous published works concern reproductive endocrinology and neuroendocrinology, and he has been principal investigator or collaborator on more than 25 related research projects since 1975. Recipient of the 2006 Lahey Clinic Research Prize, Dr Guay instructs endocrinology fellows at that institution.
**Faculty Financial Disclosure Statements**
The presenting faculty reports the following:

Dr Miner has no financial relationships to disclose.
Dr Guay has no financial relationships to disclose.

**Education Partner Financial Disclosure Statement**
The content collaborators at Miller Medical Communications, LLC., reports the following:

Lyerka D. Miller, PhD, has no financial relationships to disclose.

**Suggested Reading List**


Testosterone Replacement Therapy: Controversies and Answers

André T. Guay, MD
Clinical Professor of Medicine
Tufts University School of Medicine
Boston, Massachusetts
Director, Center for Sexual Function/Endocrinology
Lahey Clinic, North Shore
Peabody, Massachusetts

Martin M. Miner, MD
Co-Director, Men’s Health Center
Chief of Primary Care and Community Medicine
The Miriam Hospital
Clinical Associate Professor of Family Medicine and Urology
Warren Alpert Medical School
Brown University
Providence, Rhode Island

Learning Objectives
- Identify the signs and symptoms of hypogonadism and their clinical presentation
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- Select options available to effectively treat hypogonadism
- Implement monitoring strategies for patients on testosterone replacement therapy

Drug List

<table>
<thead>
<tr>
<th>Generic Name</th>
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<tbody>
<tr>
<td>Testosterone buccal system</td>
<td>Striant</td>
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<tr>
<td>Testosterone cypionate</td>
<td>Depo-Testosterone</td>
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<tr>
<td>Testosterone enanthate</td>
<td>Delatestryl</td>
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<tr>
<td>Testosterone pellets</td>
<td>TestoPel</td>
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<tr>
<td>Testosterone topical gel</td>
<td>Fortesta, AndroGel, Testim</td>
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<tr>
<td>Testosterone topical solution</td>
<td>Axiron</td>
</tr>
<tr>
<td>Testosterone transdermal system</td>
<td>Androderm, Testoderm</td>
</tr>
<tr>
<td>Testosterone undecanoate</td>
<td>Andriol (not available in the United States)</td>
</tr>
</tbody>
</table>

Testosterone Update
Facts, Myths, Reality

André T. Guay, MD
Clinical Professor of Medicine
Tufts University School of Medicine
Boston, Massachusetts
Director, Center for Sexual Function/Endocrinology
Lahey Clinic, North Shore
Peabody, Massachusetts

Presenter Disclosure Information
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- Dr Guay has no financial relationships to disclose.

Off-Label/Investigational Discussion
- In accordance with pmiCME policy, faculty have been asked to disclose discussion of unlabeled or unapproved use(s) of drugs or devices during the course of their presentations.
How Is Hypogonadism Defined by The Endocrine Society?

- A clinical syndrome that results from failure of the testis to produce physiological levels of testosterone (androgen deficiency) and the normal number of spermatozoa caused by the disruption of one or more levels of the hypothalamic-pituitary-testicular (HPT) axis.

Word Soup

- AD—Androgen Deficiency Syndrome
- ADAM—Androgen Deficiency Syndrome in the Aging Male
- Andropause, or Male Menopause
- LOH—Late Onset Hypogonadism
- Low T—Low Testosterone
- Male Hypogonadism
- TDS—Testosterone Deficiency Syndrome
  - Definition: signs and symptoms of androgen deficiency plus a biochemical level that is low or borderline (if borderline, a 3-4 month trial may be offered)

Why Do We Need Testosterone?

Does everyone need to be a baseball player?

Advertisements Appeal To Machoism

The Reality of Testosterone

Physiological Effects of Testosterone in Male Adults

- Maintains reproductive tissues
- Stimulates spermatogenesis
- Stimulates and maintains sexual function
- Increases body weight and nitrogen retention
- Increases lean body mass
- Maintains bone mass
- Promotes sebum production, and axillary and body hair growth
- Stimulates erythropoiesis

Clinical Implications of Testosterone Deficiency

- Metabolic Syndrome
- Sexual Dysfunction
- Dyslipidemia
- Inflammation
- Hypertension
- Atherosclerosis
- Vascular Stiffness
- Mortality

The Dilemma Is That Low Testosterone Levels Are Associated With Increased Mortality

Valleau Sound 8-year study of 858 men
Low T <250 ng/dL or a free T <0.75 ng/dL
All-cause mortality was 34.9% in men with low T and 20.1% in men with normal T


Recent Studies HR (95% CI) Nature Men, n Follow-Up Mortality
Shores, 2006 1.88 (1.34–2.63) Retrospective 805 8 All-cause
Laughlin, 2008 1.38 (1.02–1.85) Prospective 104 20 CVD
Khalil, 2007 2.39 (1.60–3.55) Prospective 7714 of 11,806 10 All-cause and CVD
Harring, 2010 2.32 (1.38–3.85) Prospective 1854 7.2 All-cause

Low Testosterone and Increased Mortality (N >500)

Malkin, 2010 2.27 (1.45–3.46) Prospective 500 6.9 All-cause in men with coronary disease
Thrasher, 2009 1.85 (1.20–2.12) Prospective 3014 4.5 All-cause
Mentis, 2010 1.43 (1.20–1.67) Prospective 1014 9 All-cause
Vivend, 2009 1.24 (1.01–1.54) Prospective 1056 11.2 All-cause
Consensus, 2010 7.1 (1.8–28.6) Prospective 1887 4.3 CVD

CVD=cardiovascular disease.

The Hypothalamic-Pituitary-Testicular Axis

FSH=follicle-stimulating hormone
GnRH=gonadotropin-releasing hormone
LH=luteinizing hormone

HYPOTHALAMUS → ANTERIOR PITUITARY

FSH
GnRH
LH

ANTERIOR PITUITARY

Spermatozoa

GnRH

ANTERIOR PITUITARY

LH

Sertoli Cells Leydig Cells

Testis

Seminiferous tubules

Testosterone

Not All Testosterone Is Available

Free + Bound to Albumin = Bioavailable Testosterone (BAT)
Bound to SHBG = Not Available

Testosterone in the Blood

Testosterone Bound to Albumin
Free Testosterone
Testosterone Bound to SHBG

SHBG=sex hormone-binding globulin.

Primary Hypogonadism

- Known as Hypergonadotrophic Hypogonadism
- What occurs?
  - Testicular dysfunction
  - Normal hypothalamic/pituitary function
- What results are seen?
  - Low testosterone levels
  - Impairment of spermatogenesis
  - Elevated gonadotropin levels, LH and FSH

Secondary Hypogonadism

- Known as **Hypogonadotropic Hypogonadism**
- What occurs?
  - Normal testicular function
  - Hypothalamic/pituitary dysfunction
- What results are seen?
  - Low testosterone levels
  - Impairment of spermatogenesis
  - Low or low-normal gonadotropin levels, LH and FSH

Combined Primary and Secondary Hypogonadism

- Known as **Mixed Hypogonadism**
- What occurs?
  - Aging
  - Hemochromatosis
- What occurs?
  - Testicular dysfunction
  - Hypothalamic/pituitary dysfunction
- What results are seen?
  - Low testosterone levels
  - Impairment of spermatogenesis
  - Low or low-normal gonadotropin levels (variable)

Hypogonadism Is Undertreated and Underdiagnosed

- **FACT**
  - It is not known whether hypogonadism is the cause or the consequence of these conditions

The Incidence/Prevalence of Testosterone Deficiency

- **FACT**
  - Only 5%-35% of hypogonadal men receive treatment

Obesity, Metabolic Syndrome, Diabetes, and Hypogonadism

- **FACT**
  - It is not known whether hypogonadism is the cause or the consequence of these conditions

Various Comorbidities Associated With Hypogonadism

<table>
<thead>
<tr>
<th>Condition</th>
<th>Odds Ratio</th>
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<tbody>
<tr>
<td>Obesity</td>
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<tr>
<td>Diabetes</td>
<td>2.09</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.84</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>1.47</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>1.41</td>
</tr>
<tr>
<td>Asthma/COPD</td>
<td>1.40</td>
</tr>
</tbody>
</table>

COPD=chronic obstructive pulmonary disease
Hypogonadism and Cardiovascular Disease

**MYTH**
- Men have a higher risk of cardiovascular disease, so it must be testosterone

**FACT**
- Vascular tissue contains androgen receptors

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Hypogonadism and Cardiovascular Disease

**FACTS**
- Low testosterone is associated with increased cardiovascular events and the following risk factors:
  - Dyslipidemia (including low high-density lipoprotein [HDL])
  - Hypertension
  - Obesity
  - Diabetes
- Testosterone has an inverse relationship with the following:
  - Body mass index
  - Waist circumference
  - Low-density lipoprotein (LDL)
  - Triglycerides
  - Insulin resistance


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Hypogonadism in Men With Diabetes
A Concerning Prevalence

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Prevalence (%)</th>
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</thead>
<tbody>
<tr>
<td>Mulligan</td>
<td>2006</td>
<td>50</td>
</tr>
<tr>
<td>Rhoden</td>
<td>2005</td>
<td>34-46</td>
</tr>
<tr>
<td>Dhindsa</td>
<td>2004</td>
<td>33</td>
</tr>
</tbody>
</table>


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European Male Aging Study (EMAS)
Relationship between age, BMI, and hormones

![Graph showing relationship between age, BMI, and hormones](image)

BMI=body mass index.

International Diabetes Federation. IDF Communications. 2008 2A.

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Obesity, Metabolic Syndrome, and Hypogonadism

*Risks associated with obesity*
- Type 2 diabetes
- Low total testosterone levels
- Reduced SHBG levels

*Elements of metabolic syndrome are correlated with low testosterone*
- Central obesity
- Hypertension
- Reduced HDL
- Raised triglycerides
- Raised fasting plasma glucose

International Diabetes Federation. IDF Communications. 2008 2A.
Connecting Hypogonadism-Obesity-Insulin Resistance


Leptin

Adipokines

Lower production

Insulin resistance

Hypothalamus Pituitary

Testosterone

Leydig Cells

BMI and waist circumference are not the same...
Count on waist circumference

189 cm, 93 kg = BMI 26
190 cm, 94 kg = BMI 26

Waist circumference >
Testosterone <

Connecting Hypogonadism With Osteoporosis

Primary causes

- Corticosteroid use
- Cushing syndrome
- Hypogonadism
- Excessive alcohol or tobacco consumption

Secondary causes

- Smoking
- Low calcium intake
- Vitamin D deficiency or insufficiency

Osteoporosis and Hypogonadism

FACTS

- Testosterone and estradiol levels positively associated with BMD (stronger for estradiol)
- Testosterone replacement increased spine BMD and trabecular connectivity
- However, studies are limited and none used fracture as an end point


Identification and Evaluation of the At-Risk Patient

**Martin M. Miner, MD**
Co-Director, Men’s Health Center
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Symptoms and Signs Suggestive of Hypogonadism

More Specific Symptoms and Signs
- Incomplete or delayed sexual development
- Reduced libido
- Decreased spontaneous erections
- Breast discomfort, gynecomastia
- Loss of body hair (axillary or pubic), reduced shaving
- Very small (<5ml) or shrinking testis
- Inability to father children (azoospermia, oligospermia)
- Height loss, osteoporosis, low trauma fracture, low BMD
- Hot flushes, sweats

Less Specific Symptoms and Signs
- Decreased energy, motivation, initiative, and self-confidence
- Feeling sad or blue, depressed mood, dysthymia
- Poor concentration and memory
- Sleep disturbance, increased sleepiness
- Mild anemia (normochromic, normocytic, in the female range)
- Reduced muscle bulk and strength
- Increased body fat, body mass index
- Diminished physical or work performance

Case: Henry.... History
- Henry, a 48-year-old man, university professor, and his wife meet with his PCP for a second opinion after being diagnosed with hypogonadism and offered TRT
- Low sexual desire in spite of happy marriage, mild ED, and not as focused during lectures in past 2 years
- Both parents diagnosed with type 2 diabetes in their early 50s
- Multiple allergies and gastric esophageal reflux disease
- PMH positive for HTN, dyslipidemia

Henry: Current Medications
- Omeprazole
- Loratadine
- Multivitamins
- Herbs (Maca Root)
- Atorvastatin 20 mg
- Linsinopril 20mg/HCTZ 12.5 mg

Henry: Physical Examination
- Height: 68 inches
- Weight: 205 lb
- Waist circumference: 40 inches
- BMI: 31.2 kg/m²
- Stage 1 obesity
- BP 140/82; Stage 2 treated to present
- Genital examination: normal
- DRE: normal

Symptoms and Signs Suggestive of Hypogonadism

FACTS
- No symptoms are unique to hypogonadism
- Screening with testosterone level is appropriate when presented with symptoms
- Diagnosis of hypogonadism is made when 1 or more symptoms are combined with 2 low testosterone levels <300 ng/dL
Screening for Hypogonadism

**MYTH**
- Only symptomatic patients should be screened


The ADAM Questionnaire

1. Do you have a decrease in libido (sex drive)?
2. Do you have a lack of energy?
3. Do you have a decrease in strength and/or endurance?
4. Have you lost height?
5. Have you noticed a decreased enjoyment of life?
6. Are you sad and/or grumpy?
7. Are your erections less strong?
8. Have you noticed a recent deterioration in your ability to play sports?
9. Are you falling asleep after dinner?
10. Has there been a recent deterioration in your work performance?

If the answer is "yes" to question 1 or 7, or at least 3 of the other questions, low testosterone may be present.


What Is Considered to Be a Low Serum Testosterone Level?

- Total Testosterone <300 ng/dL*
- Free Testosterone <50 pg/mL
- Bioavailable Testosterone <70 ng/dL

*Total testosterone is the most frequently used laboratory test for the diagnosis of hypogonadism in the medical literature


High Prevalence of Hypogonadism in Various Conditions May Warrant Screening

**EXPERT OPINION**
- Infertility
- Osteoporosis, low trauma fracture
- Type 2 diabetes mellitus
- Glucocorticoid, ketoconazole, opioid, or other medications that affect testosterone metabolism or production
- Moderate to severe COPD
- Sellar mass, radiation to the sellar region, or other diseases of the sellar region
- End-stage renal disease, maintenance hemodialysis
- HIV-associated weight loss
- Dyslipidemia
- Hypertension


The Diagnosis of Hypogonadism

- Patient with suspected low T
  - Measure morning TT levels
    - Low T
      - Normal T
      - Repeat morning TT
      - Normal T
      - Refer to endocrinologist
    - Low T
      - Seek other causes


Treatment Goals

- Manage expectations by partnering with the patient
- Match appropriate treatment to the individual patient
- Increase blood testosterone levels to the normal (eugonadal) range and avoid supraphysiologic peaks
- Ameliorate or cure symptoms

Common Sense in Initiating Testosterone

- Joint decision of informed patient and provider
- Short-acting preparations are better in the beginning to assess tolerability
- Start low and go slow

Henry: Laboratory Results

- Total testosterone – 230 and 210 ng/dL (300 ng/dL-1000 ng/dL)
- Free testosterone – 30 pg/mL (>50 pg/mL)
- Follicle-stimulating hormone – 6 IU/L [1 - 18]
- Luteinizing hormone – 9 IU/L [2 - 18]
- Prolactin – normal; Iron – normal
- TG 200 mg/dL; HDL 34 mg/dL
- Thyroid-stimulating hormone – 3.20 [0.52 - 4.89]
- Fasting blood sugar – 109 mg/dL
- PSA – 0.7 ng/mL

Clinical Discussion Point

How would you counsel Henry?

1. He has a diagnosis of hypogonadotrophic hypogonadism
2. The risk/benefit ratio is in favor of considering TRT
3. His ED might be only partially related to low testosterone and likely to be multifactorial
4. Initiating a weight-loss program is strongly recommended
5. All of the above

Clinical Discussion Point

All the following are a precaution for TRT, EXCEPT:

1. Severe BPH symptoms
2. Gynecomastia
3. Severe sleep apnea
4. Multiple sclerosis
5. Erythrocytosis

Henry: Conclusion

- HTN is one of the most common comorbidities with TD
- Treatment with TRT plus lifestyle changes are much more effective than TRT alone
- TRT may reverse early type 2 diabetes
- TRT may or may not improve ED; this remains controversial

Non-pharmacological Treatments Include:

- Reversal of OSA
- Exercise and weight loss
- Stress reduction (yoga, meditation)
- Reduction of opioid therapy
- Return to normal sleep architecture and quantity
- Cognitive behavioral treatment of anxiety
- All improvements in cardiometabolic health
### Pharmacologic Treatment Options

- Intramuscular injections
- Transdermal patches
- Transdermal gels and solutions
- Buccal tablets
- Subcutaneous pellets
- Oral tablets or capsules (not available in the United States)

### Intramuscular Injections

**Pros**
- History (available for 50 years)
- Self administration
- Inexpensive
- Flexibility of dosing

**Cons**
- Pain
- Frequency of injections (every 2-4 weeks)
- Symptomatic peaks and troughs resulting in variations in breast tenderness, libido, emotional stability, energy

### Transdermal Patches

**Pros**
- Nonscrotal patches
- Nighttime application results in good approximation of normal circadian plasma testosterone levels
- Flexibility of dosing

**Cons**
- Scrotal patches
- Skin irritation

### Transdermal Gels and Solutions

**Pros**
- Application sites (upper arm, shoulder, axilla)
- Low skin irritation
- Invisibility of application
- Flexibility of dosing
- Various concentrations

**Cons**
- Transfer to others (risk is minimized with high-dose, low-volume preparations)
- Low skin irritation

### Buccal Tablets

**Pros**
- Application site
- Relative invisibility
- Bypass first-pass hepatic metabolism
- Slow release

**Cons**
- Application site
- Inadvertent loss of tablet
- Gum and buccal irritation, alteration in taste
- Twice-daily dosing
- No dose titration

### Subcutaneous Pellets

**Pros**
- History (started in 1940s)
- Relative invisibility
- Long-acting
- Slow release

**Cons**
- Painful application
- Surgical procedure unlikely to be used by the PCP
- Long-acting
- Inconvenient removal
- No dose titration
- Procedure can result in infection, fibrosis, or pellet extrusion

PCP = primary care physician.
Testosterone Pellet Insertions

Results of Therapy

**FACTS**
- Restore sexual functioning and libido
- Restore sense of well-being
- Prevent loss or improve bone density
- Restore muscle mass and strength
- Improves mood


**EXPERT OPINION, NOT EXPERT EVIDENCE**
- Improvement in insulin resistance
- Decrease abdominal fat
- Decrease cardiovascular risk factors


**Effects on Diabetes From Testosterone Therapy**

- Study Design
  - A 12-month, multicenter, prospective, randomized, double-blind, placebo-controlled study

- Population
  - 220 hypogonadal men with type 2 diabetes and metabolic syndrome

- Results
  - Significantly improved insulin resistance in all patients (by 15.2% at 6 mos and by 16.4% at 12 mos)
  - Significantly improved HDL (-0.049 mmol/L) and LDL cholesterol (-0.210 mmol/L), lipoprotein-a (-0.31 mmol/L) in selected groups
  - Significantly improved sexual health (increase of 4.8 on IIEF)

Survival of Treated Versus Untreated Testosterone-Deficient Men in VA Population: Does TRT Improve Mortality?

- 1031 men aged >40 years, testosterone <250 ng/dL
- Mortality: 10.3% treated, 20.7% untreated (P<.0001)

Log rank P= .029

Cardiovascular Effects From Testosterone Therapy

**FACTS**
- Several studies suggest that high testosterone levels may have favorable effect on risk of cardiovascular disease
- A 2007 meta analysis of randomized trials showed only weak support for exogenous testosterone replacement on cardiovascular events
- In 2010, a study on older men with limitations in mobility and high prevalence of chronic disease was stopped after showing increased risk of cardiovascular adverse events: TOM Study
- Large randomized trials are needed to better assess consequences of testosterone on cardiovascular risk

Precautions in Using Testosterone

- BPH or LUTS
- Edema in patients with preexisting cardiac, renal, or hepatic disease
- Gynecomastia
- Precipitation or worsening of sleep apnea
- Azospermia; testicular atrophy
- Erythrocytosis

LUTS=lower urinary tract symptoms.


Contraindications in Using Testosterone

- Male breast cancer
- Prostate cancer: but not absolute
- Known allergic reactions or sensitivities to substrates used in all types of TRT


Provider Concerns Regarding Testosterone

Physicians Rated Reason Against Testosterone Therapy as “Very Important” (%)

<table>
<thead>
<tr>
<th>Country</th>
<th>Assured PCA Risk</th>
<th>Assured BPH Risk</th>
<th>Budgetary Reasons</th>
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<tr>
<td>Brazil</td>
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<td>Spain</td>
<td>64</td>
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<tr>
<td>United Kingdom</td>
<td>59</td>
<td>12</td>
<td>6</td>
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PCa=prostate cancer.


Historical Origin of Provider Concerns

Conclusion was based on 1 patient!


MYTH

Testosterone replacement therapy will cause prostate cancer

Prostate Cancer in Trials of Testosterone Replacement Therapy

<table>
<thead>
<tr>
<th>Study</th>
<th>Duration (months)</th>
<th>Prostate Cancer</th>
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<tbody>
<tr>
<td>Haijar et al. (1997)</td>
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<td>Shih et al. (1997)</td>
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<td>Dobbs et al. (1999)</td>
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<td>6</td>
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<td>36</td>
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<tr>
<td>Kenny et al. (2001)</td>
<td>32</td>
<td>0/33/0/34</td>
</tr>
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</table>

**Prostate Cancer and Testosterone Therapy**

**FACTS**

- Fear of causing prostate cancer leaves many appropriate patients untreated
- No evidence of causality of testosterone use and development of prostate cancer
- Testosterone will stimulate growth of existing prostate cancers
- Obtain consult for any concern
  - PSA abnormal per guidelines
  - Abnormal PSA

**References**


**BPH and Testosterone Therapy**

**FACTS**

- Patients with BPH treated with testosterone are at increased risk of worsening signs or symptoms
- Correlation of voiding volume to prostate size is poor
- Prostate size may increase in first 6 months, but generally to normal volume seen in eugonadal men
- Monitoring is strongly advised

**References**


**Monitoring Therapy (Part 1)**

**Symptoms**
- Evaluate response 3-6 months after treatment initiation and then annually

**Measuring Testosterone**
- 3-6 months after initiation
- Aim to raise level into mid-normal range
- Monitoring guidelines depend on chosen therapy

**Hematocrit**
- Check at 3-6 months, then annually

**Osteoporosis**
- Measure bone mineral density after 1-2 years

**References**


**Monitoring Therapy (Part 2)**

**Prostate**
- DRE at 3 months, then yearly
- In men aged older than 40 years, check baseline PSA, at 3-6 months and then in accordance with guidelines

**Urologic Consultation**
- PSA increase >1.4 ng/mL in any 12-month period
- PSA velocity of >0.4 ng/mL-yr after 6 months of therapy
- Detection of abnormality on DRE
- AUA/IPSS score of >19

**Adverse Effects**
- All at each visit
- Can be formulation specific

**References**

AUA=American Urological Association; IPSS=International Prostatic Symptom Score


**Measuring Testosterone: When to Check**

**Injectable Testosterone** – enanthate or cypionate
- Measure level midway between injections

**Transdermal Patches**
- Assess level 3-12 hours after application

**Buccal Tablets**
- Assess immediately before or after application of fresh system

**Transdermal Gels and Solutions**
- Any time after patient has been on for a week

**Testosterone Pellets**
- Measure at end of dosing interval
- Adjust pellets or interval

**References**


**Summary of 2010 Endocrine Guidelines**

**Diagnose**
- Only in men with consistent signs and unequivocally low serum testosterone levels
- Do not screen in general population; however, consider measurement in disease conditions with high prevalence

**Measure**
- Morning total testosterone level
- Confirm abnormal level and, if in question, assess free or bioavailable testosterone

**Treatment Goals**
- Induce and maintain secondary sex characteristics as well as sexual function
- Improve sense of well-being
- Improve muscle mass and strength, and bone mineral density

**References**

Summary of 2010 Endocrine Guidelines

- Patients with breast or prostate cancer
- A palpable prostate nodule or induration
- Abnormal PISA
- Consider consultation in high-risk patients
- Patients with erythrocytosis
- Untreated severe sleep apnea
- Severe lower urinary tract symptoms with International Prostate Symptom Score >19
- Uncontrolled or poorly controlled heart failure

Do Not Treat

The Primary Care Physician Is Essential to Disease Awareness in This Underserved Population

- Knowledge of the patient
- Long-term follow-up
- Concerns of drug safety
- Partner involvement in some cases
- Psychosocial connections
- Monitoring comorbid conditions

Conclusion

Successful treatment of hypogonadism depends on:

- Disease Awareness
- Understanding Limitations
- Realistic Expectations
- Options

Question & Answer