Palpitations/Syncope in Women

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Disclosures for EP/Women’s Talk

- Research for St. Jude, Boston Scientific, Biotronik, Medtronic
- Speaking for St. Jude, Boston Scientific, Biotronik

- Know a little about EP
- Know nothing about women
Palpitations/Syncope in Women

Perspective

Facts

Case Examples

Perspective
**“Breast Cancer is the REAL issue!”**

- Who cares about heart disease doc...I am more concerned about: BREAST CANCER and lung cancer!”

- In a recent survey, 75% of women identified cancer as their leading cause of death...

**Perspective**
In perspective:

1 in 25 women will die of breast cancer.

- 1 in 2 women will die of heart disease.

Perspective
New York Times 2006

- Puzzling differences have emerged between men and women with heart disease, making it plain that past studies, mostly done on men, do not always apply to women. Researchers have come to realize that to improve diagnosis and treatment for women, they must sort out the differences.

- "Every time we turn around, we find more gender differences, so it's important to study," said Dr. C. Noel Bairey Merz, a cardiologist at Cedars-Sinai Medical Center in Los Angeles.

Misperceptions and Missed Opportunities Leading to Access Inequity

- Women were less likely to have an EKG or be admitted to the telemetry floors.
- Women are under-diagnosed and can therefore get a false sense of security.
- Less aspirin, beta-blockers, statins, antiarrhythmic treatment, cardiac cath, PTCA, CABG
- Women were less likely to enroll in cardiac rehabilitation after an MI or bypass surgery.
First of all, on average, women tend to have a faster baseline heart rate than men. This difference is seen in girls, on an average, as young as five years old. There is also a shorter sinus node refractory time – this means that it takes a shorter time for the SA node to recover and become ready to fire an impulse again.
**Facts**

On average, the QT interval is shorter in men than in women, beginning after puberty with a linear increase through the major part of adulthood to at least age 55. This period corresponds to the time period when androgen levels are highest in men. Therefore, androgen and estrogen levels may explain the gender differences in QT interval.

**Differences in abnormal heart rhythms in men and women**

- Certain types of arrhythmias are more prevalent in women than in men. These include:
  - **Supraventricular Tachycardia (SVT) or Paroxysmal SVT (PSVT)** – a rapid heart rate that originates above the AV node, in the atria. SVT is common in both men and women, but more women have AV node reentrant tachycardia and atrial tachycardia.
  - **Sinus Node Dysfunction (also called sick sinus syndrome)** – a slow or irregular heart rhythm that originates in the SA node. The signal starts in the SA node but may be slow or delayed in progressing to the atria, causing a very slow or irregular heart beat.
  - **AV Nodal Re-entry Tachycardia (AVNRT)** - a type of SVT with a fast heart rate that originates in the AV node. Instead of the AV node sending the impulse down one pathway, there are two pathways through the AV node. The impulses travel through one pathway as well as back up through the second pathway. This allows the impulses to travel around the AV node very quickly in a circular fashion, causing the heart to beat unusually fast.
  - **Long QT Syndrome** - a QT interval longer than normal. This increases the risk for life-threatening forms of ventricular tachycardia (SCA risk).
  - **Postural Orthostatic Tachycardia Syndrome (POTS)** - a condition that affects 500,000 Americans, primarily women. Those with POTS have an abnormal response to change in position, related to the autonomic nervous system, causing drop in blood pressure, raise in heart rate and sometimes syncope (passing out), dizziness or lightheadedness.
Facts

- These arrhythmias occur more often in men, but may present differently in women.

- Atrial fibrillation - one of the most common irregular heart rhythms. It is a rapid irregular heart rhythm originating in the atria. Men have atrial fibrillation more often than women. Atrial fibrillation can be associated with other types of heart disease. Women are more likely to have atrial fibrillation associated with valve disease, while men more often have atrial fibrillation associated with coronary artery disease. The incidence of atrial fibrillation increases in both men and women with age, and when they also have hypertension and diabetes. The Copenhagen Heart Study showed that women with atrial fibrillation had an increased risk for stroke and cardiovascular death as compared to men. This is particularly true in women who have atrial fibrillation and are older than age 75. **Women who have paroxysmal atrial fibrillation, a type of atrial fibrillation that is intermittent (or comes and goes), may have a faster heart rate response than men, and tend to have longer episodes.**

- Sudden cardiac death is a sudden, unexpected death caused by loss of heart function (sudden cardiac arrest). Sudden cardiac death (SCD) occurs less frequently in women, but is still related to about 400,000 deaths per year in women. The Nurses’ Health Study showed that while the majority of women who had SCD had no prior history of cardiovascular disease before death, they had at least one cardiac risk factor (smoking, hypertension and diabetes had the greatest impact). Family history also played a role in increased risk if one parent died of heart disease before age 60. The study also showed that as with men, the majority of SCD in women was related to an abnormality of the heart rhythm (88%). This reinforces the need for careful screening of heart disease risk factors in women and managing these concerns even without symptoms present.

Symptoms of palpitations represent 15-25 percent of all the symptoms reported by female heart patients. They are associated with:
- Premenstrual syndrome
- Pregnancy
- Perimenopausal period
During perimenopause (the time period before menopause), there is a marked decrease in ovarian estrogen production. This is associated with an increase in heart rate (sinus tachycardia) and an increased frequency in palpitations and non-threatening arrhythmias, such as premature ventricular contractions or PVCs.

Menopause causes a further decline in estrogen as the menstrual cycle stops. This time period is associated with irregular heart beats, palpitations, spasmodic chest pain and nightmares in women 40 -64 years old.
Arrhythmias and pregnancy

Premature atrial beats occur in about 50 percent of women during pregnancy, although most are harmless and do not last 1. While sustained arrhythmia is somewhat rare, for those who have supraventricular tachycardia or paroxysmal SVT, the symptoms are worsened in 20 percent of cases 1. Symptoms of SVT may include shortness of breath, palpitations, and dizziness 2. Arrhythmias may occur more frequently during pregnancy due to changes in hormones, changes in associated hemodynamic, hormonal and autonomic changes and changes in circulating blood volume, sleep and emotion during pregnancy.

Arrhythmias and pregnancy

Arrhythmias in pregnancy are treated conservatively. After determining the type of arrhythmia, the physician will evaluate for underlying causes. If symptoms are minimal, rest and vagal maneuvers may be used to help slow the heart rate. Vagal maneuvers include carotid massage, applying ice to the face, and the Valsalva maneuver, which is the most successful in stopping tachycardias 4. The Valsalva maneuver involves a person exhaling forcibly with a closed glottis (the windpipe) so that no air exits through the mouth or nose as, for example, in strenuous coughing, straining during a bowel movement or lifting a heavy weight.
Facts

Arrhythmias and pregnancy

When the arrhythmia causes symptoms or a drop in blood pressure, antiarrhythmic medications may be used. No antiarrhythmic medication is completely safe during pregnancy; therefore medications are avoided during the first trimester if possible to limit risk to the fetus. Drugs with the longest safety record should be tried first. Propranolol, metoprolol, digoxin, and adenosine have been tested and shown to be well tolerated and safe during the second and third trimester 5.

Facts

Arrhythmias and pregnancy

Cardioversion is safe during all trimesters of pregnancy and can be used if necessary 1. In addition, women who have an ICD who become pregnant do not have an increased risk for ICD discharges or ICD complications. A woman who has an ICD can safely become pregnant, unless she has an underlying heart condition that would increase health risks during pregnancy.
The Heart and Estrogen/Progestin Replacement Study (HERS) found no benefit in use of hormone replacement therapy to reduce cardiovascular events, and hormone replacement therapy may even increase risk of thromboembolism (blood clot) during the first year. HRT is also associated with lengthening the QT interval, although the relevance of this finding is not known. On the other hand, HRT may decrease palpitations and other symptoms such as hot flashes, insomnia, and sweating. Therefore, it may be considered a treatment option in low risk female patients to relieve symptoms of palpitations.

*Facts*

- HRT may or may not be the answer
- BUT......
- In treating women, xanax and prozac are NOT the answer....cases to follow
Palpitations Case 1

On today's electrocardiogram, she is in ventricular bigeminy with a same morphology premature ventricular contraction. Today, however, the transition is between V3 and V4 in the V leads.

On July 22, 2005 because of typical chest pain, high cholesterol, positive smoking and positive family history for coronary disease, she had a negative stress test but because of continued chest pain had a cath. The cath showed normal coronary arteries, actually nonobstructive coronary artery disease with EF of 60%. The left main was normal. It bifurcated into the left anterior descending and circumflex and had a proximal 10-20% stenosis and a moderate-sized artery. The left anterior descending was moderate size and had luminal irregularities. The first diagonal also had luminal irregularities. The circumflex was nondominant, moderate size, gave off only one obtuse marginal and it was free of disease. The right coronary artery gave off the patent ductus arteriosus, was moderate size and was free of disease. The LV scan showed an EF of 60%.

The patient did complete a family history, social history, and review of systems form which is on my chart and which I fully reviewed. Pertinent positives include her current medications which are Zeta 10 o.d., Liptor 40 o.d. for high cholesterol, metoprolol succinate 50 o.d., Forteo 20 mg o.d., glycoprotein 1 mg o.d., and Entecort 3 mg once daily. She is allergic to “all antibiotics.” She is currently a radiation therapist from 1992 to the present. She does not drink alcohol but drinks approximately five cups of both tea and coffee per day. She does not think that this increases or decreases the palpitations. She does occasional get short of breath not necessarily related to exercise. She occasionally gets ankle swelling and leg cramps. She does have a past history of osteoporosis and cutaneous rashes. She occasionally has wheezing and is thought to possibly have a mild case of asthma. She occasionally gets heartburn. She has cutaneous, occasional muscle and joint pain and easy bruising of her skin even before taking aspirin. Aspirin 81 o.d. was recently started. She was hospitalized in May 2009 for pneumonia. She has had surgery to repair her left...
Palpitations Case 1

If you have any further questions about her care or this plan, please feel free to call me. In addition, I am ordering a chem7, magnesium, calcium and TSH just to make sure she does not have electrolyte abnormalities that might make this arrhythmia worse. Thanks for the referral.

Sincerely,

So after reassurance and a script for xanax...she comes to see us for a second opinion
Palpitations Case 1
RVOT /Cusp Propagation
Palpitations Case 1

- Stereotaxis stuff

No further xanax to date.
Palpitations Case 2

CHIEF COMPLAINT: Worsening shortness of breath and lower extremity edema.

HISTORY OF PRESENT ILLNESS: The patient is a 55-year-old Caucasian female who presented today for an outpatient transesophageal echocardiogram ordered by Amy Decker for worsening symptoms of shortness of breath and lower extremity edema. The patient reports that at this time she is not short of breath but has been noticing it over the last several months and was scheduled to have a transesophageal echo performed in January, but since her symptoms are worsening Amy Decker wanted her to have it sooner. She denies eating this morning and has not eaten since last night and denies any other complaints at this time.

PAST MEDICAL HISTORY: History of moderate mitral regurgitation with normal LVOT, history of bicuspid aortic valve, history of partial AV canal defect status post repair as an infant and history of AV block with near syncope status post permanent pacemaker, history of asthma, obesity and palpitations.


Pacer strips
Palpitations Case 2

- Eps avnrt with ablation
Syncope Case 1

HISTORY OF PRESENT ILLNESS: Ms. Belzoni, a 46-year-old female with a past medical history of sick sinus syndrome, and tachy-brady syndrome with permanent pacemaker placement 2 years ago; hypertension; questionable postural orthostatic tachycardia syndrome; COPD in which the patient is oxygen dependent; kidney stones, irritable bowel syndrome, Barrett's esophagus, and spinal fusion surgery in which the patient had a cauda equina damage following. The patient presents here for an initial visit. The patient complains that this patient experiences palpitations, in which leads to shortness of breath, lightheadedness, and dizziness, in which the patient also complains of a "foggy feeling," in which the patient becomes nauseous and has fallen and had syncopal episodes following this. The patient states this occurs mainly when standing or walking around, but can also occur when the patient is in a sitting position. The patient also has difficulty walking due to cauda equina syndrome in which she has leg pain and crutches that she uses all the time. The patient has been following up with Dr. Prang at Atlantic Cardiology and is here today for a second opinion. The patient also has a history of paroxysmal supraventricular tachycardia (SVT) in which the patient had 2 electrophysiology studies in which SVT was not inducible. During 1 of these, the patient did go into atrial fibrillation for which the patient had a direct current cardioversion.

PAST MEDICAL HISTORY: See above history of present illness.

PAST SURGICAL HISTORY: Patient had a spinal fusion permanent pacemaker placement 2 years ago, a laparoscopic placement prior to permanent pacemaker, bilateral ankle reconstructions, 6 kidney stones removed.
Syncope Case 1

EF#: 11-400

TYPE OF PROCEDURE: Dual-chamber pacemaker implant and explant of loop recorder.

INDICATION: Sick sinus syndrome, Tachybrady syndrome. Recurrent PSVT, unremitting and not responsive to medical therapy. Significant sinus pauses with clinical symptom.

REFEREING PHYSICIAN: Dr. [Name Redacted]

PROCEDURE: 600 mg of vancomycin was given perioperatively given presumed recent staphylococcus infection. Local anesthesia was used. Incision was made. Access was obtained. Under fluoroscopic guidance, RV lead was placed in the low RV septum. RA lead was placed in the right atrial appendage. Leads were sutured to the underlying fascia. The pocket was flushed. The clinical loop recorder was explanted and leads were tested and the device was attached. The pocket was closed with 5-0 and 3-0 Vicryl. Steri-strips were applied at the end of the case.

[Medical record number redacted]
RA lead is a Medtronic, model 
[Number Redacted]

Syncope Case 1

After multiple monitor strips revealed above and prozac was not working she came for a second opinion....
**Syncope Case 1**

- **Inappropriate sinus tachycardia**

- **Inappropriate Sinus Tachycardia (IST)** is a rare type of cardiac arrhythmia, within the category of supraventricular tachycardia (SVT). IST may be caused by the sinus node itself having an abnormal structure or function, or it may be part of a problem called dysautonomia, a disturbance and/or failure of the autonomic nervous system. Research into the mechanism and etiology (cause) of Inappropriate Sinus Tachycardia is ongoing.

- The mechanism and primary etiology of Inappropriate Sinus Tachycardia has not been fully elucidated. An autoimmune mechanism has been suggested as several studies have detected autoantibodies that activate beta adrenoreceptors in a portion of patients.\(^1\) The mechanism of the arrhythmia primarily involves the sinus node and peri-nodal tissue\(^2\) and does not require the AV node for maintenance. Treatments in the form of pharmacological therapy or catheter ablation are available, although it is currently difficult to treat successfully.

**Syncope Case 1**

- Symptoms reported by patients vary in frequency and severity.

- Symptoms associated with IST include:

  Frequent or sustained palpitations\(^1\)
  Dyspnea (shortness of breath) and palpitations on exertion
  Pre-syncope (feeling as if about to faint)
  Fatigue (physical)
  Dizziness
  Exercise intolerance
  Occasional paresthesia and cramping
  Symptoms associated with autonomic nervous system disturbance, including GI disturbance
Inappropriate sinus tachycardia (IST), first described in 1979 (1), is a fast heart rhythm arising from the sinus node, the normal primary pacemaker of the heart. That is, the heart rhythm is arising from the normal location but at an inappropriately high rate. Usually patients with IST are young women employed in the healthcare field. The exact reason for this is unknown. Usually, patients with IST come to medical attention first in their teens, twenties, or thirties. Patients usually have symptoms of palpitations and/or out-right heart racing. Associated symptoms may include chest pain, pulsations in the neck, shortness of breath, light-headedness, fatigue, sweating, etc. They typically feel their heart racing throughout the day. In some patients, antibodies are present which bind to the cardiac beta-receptors activating them (2).

Female Prodominance

OI (orthostatic intolerance) is significantly overrepresented in young women, and the severity of orthostatic symptoms sometimes shows a cyclical change. The exact reasons for this is unknown. Possible reasons for these cyclical changes include an estrogen-dependent change of the plasma volume or a direct estrogen receptor-mediated modulation of vascular reactivity.
Syncope Case 1

- Automonic dysfunction

- Ep procedure
- Pacer cls slides
**Syncope Case 1**

**CHIEF COMPLAINT:** Syncope.

**HPI:** The patient is a 35-year-old Caucasian female, presenting today with chief complaint of syncope. The patient reports that she was leaning over a set of stairs at home to pick up a scissors and then was reportedly witnessed to have the syncope and collapse episode that was less than a minute in duration. Patient reportedly hit the right elbow but did not hit her head, as her husband was the witness. After the event the patient was noted to be confused, however, within minutes she was alert, oriented, and appropriate. Of note, the patient reports that she has had issues with lightheadedness and has been diagnosed with orthostatic issues for the past 3 to 4 years, however in the past 3 months the patient reports that she no longer gets the typical aura that she used to get with these episodes and more recently she has been having syncope episodes that are unusual for her. She has never had a neurological workup or cardiac workup. The only vitals per patient is from her primary care physician, and her symptoms have been attributed to orthostatic syncope recently.
PAST MEDICAL HISTORY:
1. Depression.
2. Bipolar disorder.
4. Chronic migraines.
5. Fibromyalgia.
6. History of hypothyroidism. The patient reports being off her medication for 2 years, as directed by her primary care physician.
7. History of gestational hypertension with her last child about 3 years ago.

SURGERIES:
1. Gastric bypass.

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*A little more prozac later.....*
Torsades de Pointes

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**Cardiac Action Potential-APs**

- **Phase 0:** Depolarization
- **Phase 1-3:** Repolarization
- **Phase 4:** Resting State

**LQTS channel defects**

- **Inward currents** mainly Ca++
- **Fast inward Na+ current**
- **Outward currents** mainly K+
Channelopathies

Diseases involving Ion Channel Function

- Dry mouth syndrome
- Migraine
  - CACN1A
- Deafness
  - KCNQ4
- Myotonia
  - CIC/1
- Kidney Stones
  - CIC5
- Tinnitus
- Epilepsy
  - CHRNA4
  - KCNQ
- Diseases involving CIC
- Osteopetrosis
  - CIC7
- Cystic fibrosis
  - CFTR
- Long QT
  - KCNQ
- Hypertension
- Diarrhea
  - CI channel
- Cancer
- Multiple sclerosis
- Incontinence

Acquired

Drugs That May Provoking Life-Threatening Arrhythmias in LQTS*

**Antiarrhythmics**
- Amiodarone, Disopyramide, Dobutilide, Ibutilide, Procainamide, Quinidine, Sotalol

**Antiinfective & Antifungal**
- Amantadine (Symmetrel), Azithromycin, Chloroquine, Clarithromycin (Biaxin), Clindamycin (Cleocin)**, Erythromycin, Gatifloxacin, Halofantrine, Itraconazole, Moxifloxacin (Avelox), Pentamidine (NebuPent), Sparfloxacin (Zagam), Sulfamethoxazole-Trimethoprim (Bactrim, Septra)

**Psychotropics**
- Dolasetron (Anzemet), Doxepin (Sinequan), Haloperidol (Haldol), Levactylmethadol (Oraam), Mesoridazine (Serentil), Phenothiazines, Risperidone (Risperdal), Thiothixene (Navane), Thoridazine (Mellaril), Thorazine, Tricyclics, Ziprasidone (Geodon)

**Others**
- Albuterol (Proventil), Bepridil (Vascor), Diuretics (water pills), Epinephrine (Adrenaline), Felbamate (Felbatrol), Ketanserin, Methadone, Pimozide (Orap)

* Some drugs are unsafe only when used in combination with other drugs.
**Acquired**

- **Risk factors commonly identified**
  - Female gender
  - Heart disease (cardiac hypertrophy, chronic heart failure, cardiomyopathies)
  - Hypokalemia, hypocalcemia and hypomagnesemia
  - High drug levels (impaired metabolism or excessive dosage)
  - Drug interactions (concomitant use of 2 drugs that prolong the QT interval)

- **Risk factors less commonly identified**
  - Bradycardia
  - Diuretic use
  - History of congenital long QT syndrome
  - Prolonged baseline QT interval
  - Genetic variants (polymorphisms or mutations)

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**Summary**

*Long QT syndromes cross over substrate and trigger*

*Congenital*  *Acquired*
Prozac-Adding Insult to Injury

Summary

- Perspective
- Facts
- Cases