

# Cracking the Case: The Relationship Between Bones and Hormones

by

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You are starting your second week of a five-week rotation with a local medical doctor. You have found your experience exciting thus far and you're eager to see what this week will hold. As part of your rotation you get to accompany the physician, Dr. Lee, on rounds and diagnoses. There are two patients scheduled for this morning and you both head off to see the first patient.

## Part I – Shino Yang

In Exam Room 1 you find Shino Yang, a 58-year-old Chinese female. Shino is here for a follow-up appointment. She broke her wrist a few months ago and is here to check on the progress and to undergo some additional tests. Shino is a relatively healthy woman who likes to swim, but admits that she hasn't been exercising like she used to. She eats lots of vegetables and sea food, avoids most dairy products, seldom drinks, and she smokes (she's been trying to quit for years). She went through menopause at the age of 51. Today, she is feeling pretty good but has some lower back pain, and is concerned about her wrist because when her mother got older she suffered from two broken hips.

### Lab Results

<i>Measure</i>	<i>Result</i>	<i>Normal Range</i>
BMI (5'0", 88 lbs)	17.2	18.5–24.9
Serum thyroxine ( $T_4$ ) (ug/dl)	9.0	4.6–12
Thyrotropin (TSH) ( $\mu$ IU/mL)	3.4	0.5–6
Serum triiodothyronine ( $T_3$ ) (ng/dl)	120	80–180
Blood pressure	100/66	90–120/60–80
Hematocrit (%)	37	36–48
Hemoglobin (g/100 ml blood)	11.8	11–14
Glucose (mg/dl)	86	70–110
Blood sodium (mmol/L)	139	135–145
Blood potassium (mmol/L)	3.9	3.5–5.0
Blood calcium (mg/dl)	8.8	8.5–10.2
Vitamin D (ng/ml)	27.5	30–74
24-hr urine calcium (mg/day)	382	100–300
Bone density scan T-score	-3.5	-1 or above

### Questions

1. Based on the lab results, are any of Shino's values abnormal?
2. What is your diagnosis of Shino? What information/data leads you to this conclusion? What do you think is causing Shino's diagnosis? (Confirm this with your instructor before moving on.)

## Part II – Shino’s Treatment

### Questions

1. What role does estrogen play in bone remodeling? (Be specific; discuss RANK, RANKL and OPG.)
2. Dr. Lee has asked you to describe the diagnosis and risk factors of the disease to the patient. What would you tell Shino about her diagnosis and condition?
3. Dr. Lee recommends a drug called Prolia (denosumab). What is the mechanism of action of Prolia?
4. Why would Prolia be a good recommendation for the patient? Describe how the actions of the drug would help someone with Shino’s condition.
5. Additionally, Dr. Lee suggests that Shino begin exercising every day. What types of exercises, specifically, would you recommend Shino engage in? Why?
6. Patients with Shino’s condition are often told to take calcium and vitamin D supplements. According to NIH, what are the standard doses for these two supplements?
7. What role do calcium and vitamin D play in bone health?



## Part IV – Eleanor’s Treatment

### Questions

1. What role(s) do glucocorticoids play in bone remodeling? (Be specific; discuss RANK, RANKL, and OPG.)
2. Dr. Lee recommends that Eleanor start a bisphosphate drug called Fosamax (alendronate). What is the mechanism of action for this drug? (You might need to look at Merck’s website.)
3. Why would Fosamax be a good recommendation for the patient? Describe how the actions of the drug would help someone with Eleanor’s condition.
4. Eleanor asks if she should take calcium and vitamin D supplements. How would you respond?



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