Test Your Knowledge: OncoNephrology

The overlap of hematology, oncology, and nephrology has led to the creation of a field called Onconephrology. Cancer survivors are living longer and developing chronic kidney disease. Novel chemotherapy agents are nephrotoxic. The field of paraproteinemias is advancing, and MGUS is now been associated with kidney disease. Cancer centers around the world need a dedicated onconephrologists to take care of these patients. A recent AJKD Core Curriculum article addresses the key issues associated with Onconephrology. Test your knowledge on this fascinating field with the questions listed below.

1. Hypomagnesemia from urinary magnesium loss is seen with all of the following medications except:
   A. Cisplatin
   B. Carboplatin
   C. Cetuximab
   D. Omeprazole

2. What are the lab parameters seen with tumor-induced osteomalacia?
   A. High FGF-23, low 1,25 dihydroxyvitamin D3, low serum phosphorus, normal serum calcium
   B. Low FGF-23, low 1,25 dihydroxyvitamin D3, high serum phosphorus, normal serum calcium
   C. High FGF-23, high 1,25 dihydroxyvitamin D3, low serum phosphorus, high serum calcium
   D. Low FGF-23, high 1,25 dihydroxyvitamin D3, low serum phosphorus, low serum calcium

3. Which one of the following chemotherapeutic agents causes a capillary leak syndrome?
   A. Carmustine
   B. Ifosfamide
   C. Interleukin-2
   D. Sunitinib

4. Which pure BRAF inhibitor is now associated with tubular toxicity in clinical practice?
   A. Sunitinib
   B. Vemurafenib
   C. Dabrafenib
   D. Axitinib

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Solutions to AJKD Blog’s **Test Your Knowledge: OncoNephrology**

1. **D**: Hypomagnesemia can occur as a result of gastrointestinal (GI) as well as urinary losses. **Proton pump inhibitors are responsible for GI loss of magnesium** as they inhibit the TRPM 6/TRPM 7 (Transient Receptor Potential Melastatin channels) located on the intestinal epithelial cells. Urinary magnesium levels are appropriately low in patients with hypomagnesemia due to PPI. **Cisplatin, carboplatin, and cetuximab** are all responsible for urinary magnesium losses.

2. **A**: Tumor-induced osteomalacia (TIO) is a rare paraneoplastic syndrome characterized by elevated phosphatonins (FGF-23), renal phosphate wasting, hypophosphatemia, and abnormal vitamin D metabolism. It is usually seen in benign mesenchymal tumors and head and neck cancers. FGF-23 is an important hormone synthesized by osteocytes and osteoblasts. It is still an enigma as to how FGF-23 down-regulates renal phosphate re-absorption, but it likely occurs in the proximal tubule. FGF-23 also inhibits calcitriol synthesis in the kidney, and stimulates the catabolism of active vitamin D sterols. This way, FGF-23 also indirectly decreases intestinal absorption of phosphate. In addition, it also decreases intestinal sodium phosphate transporters, leading to lower 1,25 vitamin D levels. The calcium levels are usually normal.

3. **C**: [Table 3 in the Core Curriculum article](#) discusses the different types of renal toxicities of chemotherapy agents. IL-2 leads to decreased calcitriol synthesis capillary leak syndrome, and usually occurs in the first 24-48 hours. Carmustine leads more to a chronic kidney disease. Ifosfamide is known to cause Fanconi syndrome, AKI, CKD, and SIADH. Sunitinib is a tyrosine kinase inhibitor that can cause thrombotic microangiopathy (TMA), proteinuric kidney disease, or **acute interstitial nephritis**.

4. **B**: Sunitinib and Axitinib are not pure BRAF inhibitors. Of the two BRAF inhibitors, [vemurafenib has been now reported to cause](#) biopsy-proven tubulointerstitial damage. Dabrafeni can cause AKI, but data in sparse. **Electrolyte disorders** have been reported with these agents as well.