

Shedding Light on Radiation Induced Vascular Injury

Alyssa Volmrich MD/MBA, Minh Quan Le MD, and Laura Huang MD

Department of Physical Medicine and Rehabilitation at the University of Miami Miller School of Medicine, Miami, FL

INTRODUCTION

The patient is a 58-year-old female with a history of right thigh sarcoma diagnosed with popliteal artery occlusion due to radiation induced injury.

CASE DESCRIPTION

Patient is a 58-year-old female with history of soft tissue sarcoma of right thigh s/p resection in 2017. She completed 6 cycles of adjuvant gemcitabine and docetaxel chemotherapy and 66 Gy radiation therapy given over 33 fractions. She presents to cancer rehabilitation clinic for radiation fibrosis of the thigh, lymphedema of right lower extremity managed with compressive garment, and residual chemotherapy induced peripheral neuropathy treated with gabapentin.

Three weeks after her clinic visit, patient called the office complaining of symptoms described as cold, pale, and worsening right lower extremity pain. She was immediately referred to the emergency department where a right popliteal artery occlusion was found on ultrasonography.

Patient was started on aspirin, statin and underwent successful revascularization with balloon angioplasty of the distal right superficial femoral artery.

Patient had no other risk factors for atherosclerotic disease and her focal lesion was attributed to her prior radiation exposure.

PATHOPHYSIOLOGY

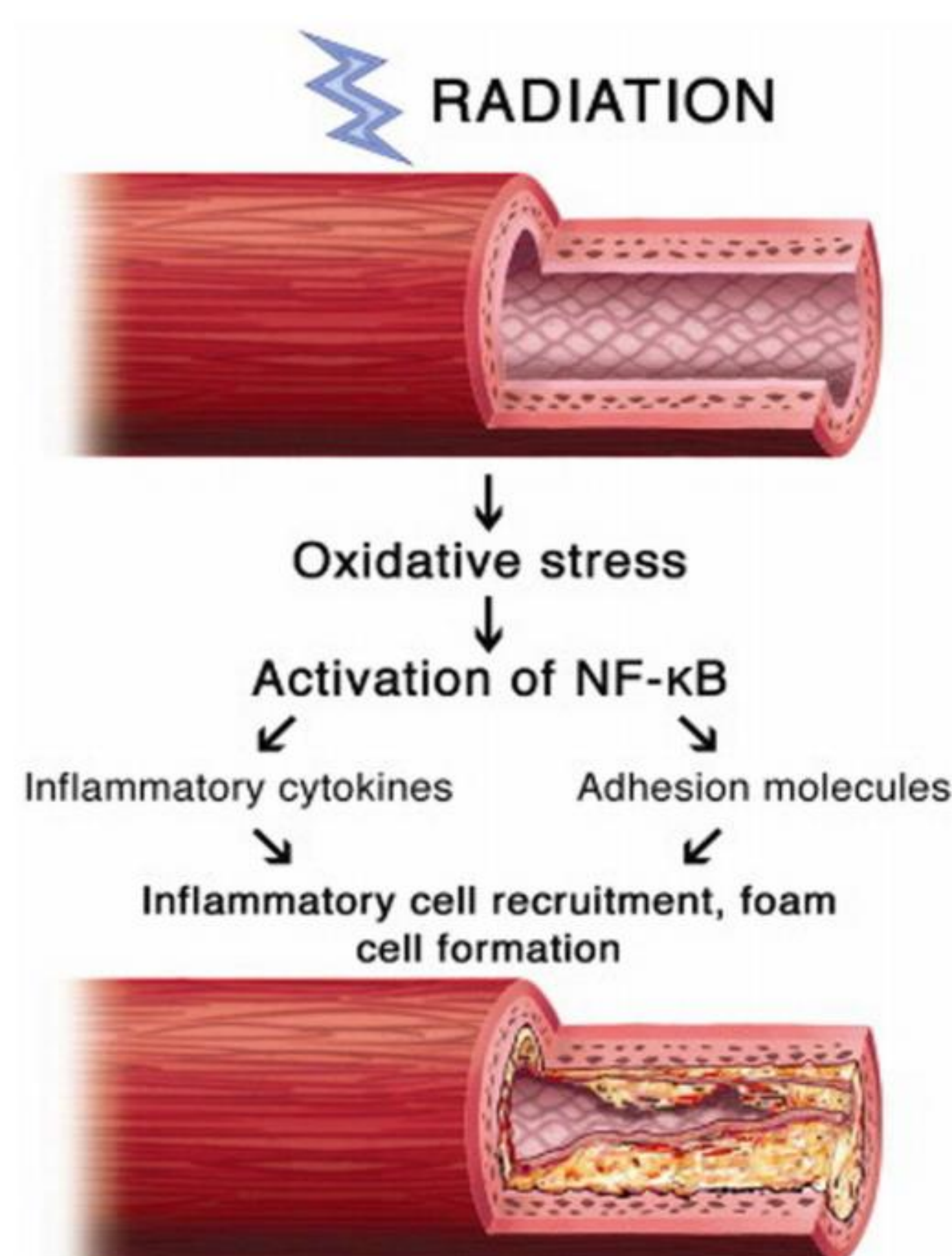


Image 1: Depiction of mechanism of radiation induced vascular injury²

DISCUSSION

Despite modern technological advancement, radiation-induced vascular injury remains a clinical conundrum. Radiation leads to a chronic increase in free radical production and radiation induced oxidative stress, leading to endothelial injury and chronic inflammation with resultant accelerated atherosclerosis.^{2,3} Arterial insufficiency should be considered when evaluating a cancer survivor with history of external beam radiation presenting with extremity pain.

As cancer survivorship continues to increase, radiation-induced vascular injury may become a more common diagnosis affecting function and quality of life. Radiotherapy has also been well reported in the literature to cause coronary artery and carotid artery disease in patients who were treated with thoracic and neck radiation, respectively.¹ Understanding the long term complications of radiotherapy treatments is essential in patients presenting to rehabilitation clinics with symptoms of new pain.

IMAGING



Image 2: Muscle atrophy and fibrotic soft tissue changes of the patient's thigh

CONCLUSIONS

Chronic arterial injury as a late effect of radiation induced tissue damage should be considered when evaluating cancer survivors with extremity pain. A comprehensive rehabilitation evaluation is essential to assess for and manage this late radiation effect, in addition to other more commonly seen late effects of limited range of motion, nerve injury and lymphedema.

REFERENCES

1. Armanious MA, Mohammadi H, Khodor S, Oliver DE, Johnstone PA, Fradley MG. Cardiovascular effects of radiation therapy. *Curr Probl Cancer* 2018 Jul;42(4):43-442. doi:10.1016/j.currprobcancer.2018.05.008. Epub 2018 Jun 12. PMID: 30006103.
2. Taunk, Neil K., et al. "Radiation-Induced Heart Disease: Pathologic Abnormalities and Putative Mechanisms." *Frontiers in Oncology*, vol. 5, 2015, doi:10.3389/fonc.2015.00039.
3. Weintraub NL, Jones WK, Manka D. Understanding radiation-induced vascular disease. *J Am Coll Cardiol*. 2010;55(12):1237-1239. doi:10.1016/j.jacc.2009.11.053