

## Hyperbaric Wound Photos

### Background

**Background:** Therapeutic radiation has been shown to cause delayed complications. Delayed radiation complications can become apparent from six month to years after radiation exposures. Current evidence demonstrates how radiation dose can be related to soft tissue damage. However, patients' responses to radiation can be variable. During fluoroscopy, the patient may receive one to five rads per minute (J. Eisenbarth, personal communication, May 15, 2013). As hyperbaric oxygen therapy (HBOT) can improve vascular integrity, stimulate angiogenesis and promote neovascularization in radiated tissues (Kindwall & Whelan, 2008), delayed radiation injury patients can be treated successfully with HBOT.

### Patient Description

This study involves a 53 year old male patient who had a previous history of :

- transverse myelitis at the T10 through T12 levels
- arteriovenous malformations between T4 and T6 vertebrae.
- multiple embolizations for spinal arteriovenous malformations under fluoroscopy.
- non-healing spinal wounds.

### Interventions

Interventions for the non-healing wounds included:

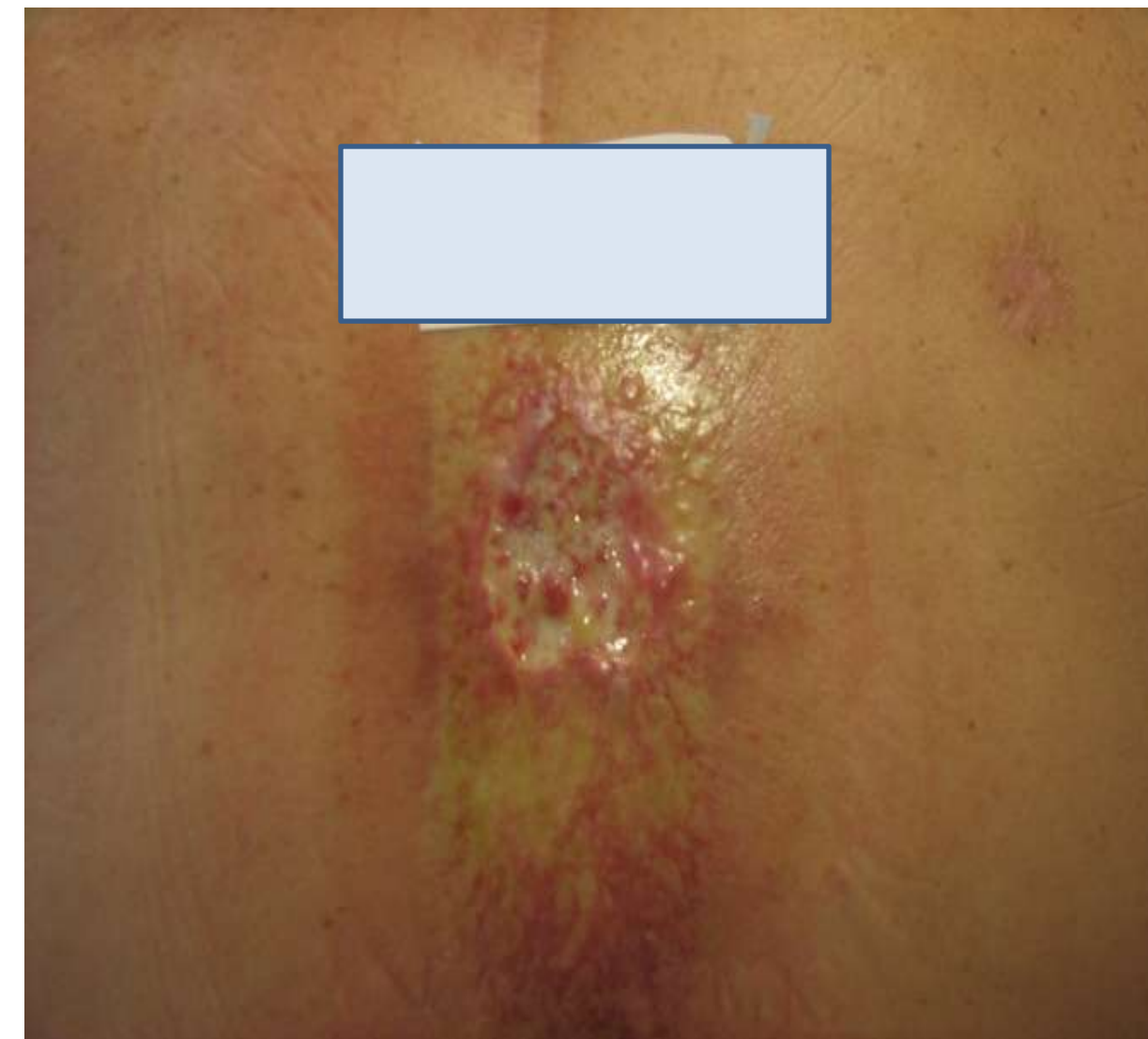
- > 2 years of wound care
- antibiotics
- off-loading of pressure to spine area
- 60 HBOT treatments at 2 ATA for 90minutes
- flap/graft surgeries
- vacuum-assisted wound closure

### Methods

- Clinical history and details were reviewed.



Pretreatment- rash that developed into ulcers.



Treatment 60- Moderate improvement

### Result



### Discussion

It is scientifically known that hyperbaric oxygen therapy (HBOT) stimulates angiogenesis and causes neovascularization in poorly oxygenated tissues (Kindwall & Whelan, 2008). Capillary proliferation improves tissue perfusion and supports healing of irradiated areas. Until recently, radiation doses from fluoroscopy could only be estimated. The threshold radiation doses for soft tissue injury ranges from 1500-2000 rad for moist desquamation, dermal necrosis, and secondary ulceration (J. Eisenbarth, personal communication, May 15, 2013). There are typical skin changes from fluoroscopic radiation (Killewich, Falls, Mastracci, & Brown, 2011) such as a rectangular shaped erythematous appearance to the skin seen in our patient. This can progress to moist desquamation, skin sloughing, and secondary ulceration (Killewich et al.). HBOT should be considered when a wound develops in a field that previously received fluoroscopic radiation. HBOT is an effective treatment for late radiation tissue injury (Undersea Hyperbaric Medical Society, 2013). Although uncommon, it is important that such injuries are identified so that appropriate therapies are instituted. After hyperbaric therapy, the wound improved but did not fully heal. Debridement of the wound followed by a flap with grafting for coverage were successfully performed.

### Conclusions

Late radiation injury after fluoroscopy is rare and may not be manifested for months to years. It is important to consider this in the differential diagnosis of a problem wound. Once the diagnosis is made, HBOT should be considered in the treatment plan.

### References

Killewich, L. A., Falls, G., Mastracci, T. M. & Brown, K. R. (2011, January). Factors affecting radiation injury. *Journal of Vascular Surgery*, 9s-14s. doi: 10.1016/j.jvs.2010.07.025

Kindwall, E. P. & Whelan, H. T. (Eds.). (2008). *Hyperbaric medicine practice* (3<sup>rd</sup> ed.). Flagstaff, AZ: Best Publishing Company,