

# Radiation-Induced Arterial Injury in the Upper Limb

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The importance of radiation therapy for breast cancer has increased in recent years. According to the "Japanese Structure Survey of Radiation Oncology in 2009 (Report)" by the Japanese Society for Radiation Oncology (JASTRO) database committee, in the new patients who underwent radiation therapy, breast cancer was the most common cancer type (23.3%) based on the primary lesion [29].

RIAI in the carotid artery and RIAI in the subclavian to axillary arteries must have the same mechanism of onset. Considering the number of case reports, it is likely that many patients are not diagnosed, and we believe that clinicians need to be more aware of this condition.

## Discussion

The general mechanism of action can be broadly divided into three stages.

First, it is considered that irradiation causes endothelial dysfunction [30]. Endothelial cell damage accelerates vascular permeability, and serum mucopolysaccharide is deposited on the endothelium, causing intimal hyperplasia. In addition, it has been reported that radiation exposure subsequently activates nuclear factor-kappa B [31] and can cause  $\text{ICAM-1}$  due to oxidative stress [32]. It has been reported that  $\text{ICAM-1}$  and  $\text{VCAM-1}$  markers can rise soon after radiation exposure, which may be useful predictors of angiostenosis caused by RIAI; however, further evaluation of this  $\text{ICAM-1}$  is needed [33].

Second, vasa vasorum damage causes focal necrosis of the media, resulting in adventitial chronic  $\text{ICAM-1}$  and so forth [34,35].

These changes ultimately promote arteriosclerosis, which leads to stenosis and obstruction.

## 7. Clinical Features

Clinical features of RIAI include the following: the irradiation site and the lesion site coincide, lesions can occur with relatively low radiation doses of approximately 40-80 Gy, several years may pass from irradiation until the appearance of symptoms, and the lesions pathologically appear to be the same as arteriosclerotic lesions [5,6,36-42]. It has been reported that the time from irradiation until

those of lymphedema and neuropathy following surgery for breast cancer, and requires careful examination.

## FYfYbWg

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