



## Radiation Induced Fibrosis

### FACT

Radiation induced fibrosis is a late effect of radiotherapy, typically developing months to years after treatment. It occurs when radiation damages small blood vessels, connective tissue, and fibroblasts, leading to chronic inflammation and excessive collagen deposition. This causes stiffening, scarring, and contracture of muscles and soft tissues.

### Chris Curtis

Head & Neck Cancer Survivor

### Warning:

This information is provided for general educational purposes only. It is not a substitute for professional medical advice, diagnosis, or treatment. Always consult your oncologist, radiation specialist, or rehabilitation physician before beginning any new exercise or therapy, especially following radiation, surgery, or if you have carotid, swallowing, or nerve-related issues. Stop immediately and seek medical advice if you experience pain, dizziness, or new neurological symptoms.

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### What Is Radiation-Induced Fibrosis (RIF)?

Radiation induced fibrosis is a late effect of radiotherapy, typically developing months to years after treatment. It occurs when radiation damages small blood vessels, connective tissue, and fibroblasts, leading to chronic inflammation and excessive collagen deposition. This causes stiffening, scarring, and contracture of muscles and soft tissues.

#### In the head and neck, this most often affects:

- Sternocleidomastoid, trapezius, and scalene muscles
  - Platysma and subcutaneous tissues
  - Skin and fascia around the jaw, neck, and shoulders
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### Common Symptoms and Functional Impact

Patients can experience:

- Neck tightness and stiffness
- Painful or involuntary neck spasms (“fibrotic myospasms”)
- Limited range of motion (difficulty turning or tilting the head)
- Postural imbalance (head tilt or shoulder droop)
- Swallowing or speech difficulties (if fibrosis involves deeper musculature)
- Lymphedema exacerbation, as fibrosis obstructs lymphatic drainage

These changes often progress slowly, but without intervention they can become irreversible.

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### Pathophysiology (Simplified)

Radiation → chronic tissue hypoxia + oxidative stress → activation of TGF-β1 and fibroblasts → excessive collagen and extracellular matrix → fibrotic remodelling  
This cascade is self-perpetuating once fibrosis is established, it tends to worsen unless managed proactively.

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## Management Strategies

While there's no complete "cure," multidisciplinary management can reduce pain, improve mobility, and slow progression.

### 1. Physical Therapy (Cornerstone)

- Manual therapy and myofascial release: To reduce tissue stiffness and break down adhesions.
- Gentle stretching and range-of-motion exercises: Daily neck extension, rotation, and side flexion.
- Postural training: To counteract compensatory neck and shoulder imbalance.
- Consistency is key: Regular exercises (even brief daily sessions) make a big difference.

*Specialized therapists in "oncologic rehabilitation" or "head & neck lymphedema/ fibrosis management" are ideal.*

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### 2. Medications

- Muscle relaxants: e.g., *baclofen*, *tizanidine*, *cyclobenzaprine* for spasms.
  - Neuropathic pain agents: *gabapentin*, *pregabalin* if nerve irritation is present.
  - Pentoxifylline + Vitamin E (tocopherol):
    - Some studies show benefit in reducing established fibrosis and improving tissue pliability, especially when used together.
    - Typical regimen: Pentoxifylline 400 mg TID + Vitamin E 1000 IU/day (under medical supervision).
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### 3. Injections or Procedures

- Botulinum toxin (Botox) injections:
    - Helpful for focal neck spasms (especially in the sternocleidomastoid or trapezius).
    - Can reduce pain and improve range of motion for several months.
  - Trigger point injections or dry needling: Sometimes used by pain specialists or physiatrists.
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### 4. Adjunctive / Experimental Approaches

- Low-level laser therapy (Photobiomodulation): Some evidence for improved tissue elasticity and pain relief.
- Hyperbaric oxygen therapy (HBOT): May aid microvascular repair in selected cases.
- Anti-fibrotic agents under study: e.g., *pirfenidone*, *imatinib* — not yet standard of care.

## 5. Lymphedema Management

If swelling is contributing to tightness:

- Manual lymphatic drainage (MLD)
  - Compression therapy (custom neck garments)
  - Elevation and exercise
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## Practical Daily Measures

- Warm compresses before stretching.
  - Gentle self-massage using a neutral lotion or vitamin E oil.
  - Avoid sleeping with elevated or rotated neck positions.
  - Stay hydrated and maintain good posture (especially when using screens).
  - Track symptom progression — sudden worsening may signal infection, nerve irritation, or need for therapy adjustment.
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## When to Seek Further Help

Contact your medical team if you notice:

- New or worsening pain, spasms, or skin changes
- Increasing difficulty swallowing or breathing
- Sudden loss of mobility or new nerve symptoms

A rehabilitation medicine (physiatry) or head & neck survivorship clinic can coordinate a personalized plan.

## Daily Neck Stretching & Mobility Routine

for Radiation-Induced Fibrosis and Spasms (Head & Neck Cancer Survivors)

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## Program Overview

- Frequency: 1–2 times daily (morning & evening)
  - Duration: 10–15 minutes
  - Warm-up: Apply a warm compress or moist heat for 5–10 minutes
  - Goal: Maintain flexibility, reduce stiffness and spasms, improve posture
  - Rule: Stretch to *mild tightness*, never into pain
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### **Step 1. Gentle Range of Motion**

#### 1. Neck Flexion & Extension

- Lower chin to chest → hold → return.
- Gently look upward → hold → return.
- Repeat 5× each direction.

#### 2. Neck Rotation

- Slowly turn head right → hold → return.
- Repeat left.
- 5× each side.

#### 3. Lateral Flexion (Side Bending)

- Bring ear to shoulder (without lifting shoulder).
  - Hold 20–30 sec, 3× each side.
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### **Step 2. Targeted Fibrosis & Spasm Release**

#### 1. Sternocleidomastoid (SCM) Stretch

- Place right hand on chest.
- Tilt head back and to the left (away from tight side).
- Hold 20–30 sec → repeat both sides.

#### 2. Upper Trapezius Stretch

- Sit upright, hold chair edge with one hand.
- Gently pull head toward opposite shoulder.
- Hold 20–30 sec → both sides.

#### 3. Platysma/Anterior Glide

- Gently slide head backward (“double chin”), then move lower jaw forward slightly.
  - Hold a few seconds → repeat 5×.
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### **Step 3. Shoulder & Scapular Work**

1. Shoulder Rolls: 10 backward + 10 forward.

2. Scapular Retraction: Squeeze shoulder blades together 5 sec ×10–15 reps.

3. Wall Angels: Slide arms up/down against wall 10×.

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#### **Step 4. Myofascial Massage (Optional)**

- Use fingertips or a soft ball for circular massage along SCM, trapezius, and upper chest (1–2 min).
  - Use lotion, vitamin E oil, or aloe for glide.
  - Oncology-trained physical therapists can enhance results with manual therapy.
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#### **Step 5. Relaxation & Spasm Control**

- Deep breathing: Inhale through nose, exhale slowly ×10.
  - Heat or gentle TENS: 10–15 min post-stretch.
  - Magnesium (if approved) may help reduce muscle cramps.
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#### **Weekly Progression Plan**

Week	Focus	Goal
1–2	Gentle ROM + heat	Decrease stiffness/pain
3–4	Add targeted stretches	Improve rotation/flexion
5–6	Add light resistance	Strengthen posture
Ongoing	Maintain mobility	Prevent re-fibrosis

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#### **Precautions**

- Avoid aggressive stretching or sudden neck movements.
  - Do not perform deep massage over carotid area or surgical scars without clearance.
  - Discontinue if you feel sharp pain, dizziness, tingling, or numbness.
  - Always check with your treating team before starting or advancing exercises.
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#### **Adjunctive Options (Discuss with Your Doctor)**

- Pentoxifylline + Vitamin E for fibrosis softening
  - Botulinum toxin for focal spasms
  - Low-level laser therapy (Photobiomodulation) for tissue elasticity
  - Speech/swallow therapy if fibrosis affects swallowing
  - Lymphedema management (manual drainage, compression)
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## FACT SHEET

### Final Note

This routine is meant to support not replace your medical care. Every case of radiation-induced fibrosis is unique; adjustments should be made under the supervision of your oncologist, physiatrist, or oncology physical therapist. Gentle consistent movement is the safest and most effective long-term approach.