Low Dose Radiation Therapy for Benign Conditions

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Boulder Community Health

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Musculoskeletal Radiation Therapy

Boulder Community Health

Update on Evidence & Radiation Treatment Indications for Non-Malignant ("Benign") Inflammatory Musculoskeletal Conditions Such as Osteoarthritis, Plantar Fibromatosis & Palmar Fibromatosis

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Disclosures: None

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Outline

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- Overview of radiation therapy
- Overview of musculoskeletal conditions
- Summary of data
- Radiation therapy details
- Radiation capabilities at Rocky Mountain Cancer Centers

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Objectives

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- Identify non-malignant conditions treated with radiation therapy
- Diagnose plantar and palmar fibromatosis
- Identify wherein low-dose radiation therapy can be used in osteoarthritis treatment algorithm
- Explain the toxicity / side effects associated with low-dose radiation therapy

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Overview of Radiation Therapy: Non-Malignant Conditions

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- Meningiomas
- Schwannomas
- Paragangliomas
- Arteriovenous malformations
- Trigeminal neuralgia
- Cavernomas and hemangiomas
- Refractory ventricular tachycardia
- Hidradenitis suppurativa
- Graves Ophthalmopathy
- Keloids (prevention of disease occurrence/recurrence)
- Heterotopic ossification (prevention of disease occurrence/recurrence)
- Gynecomastia secondary to hormone therapy for prostate cancer
- **Inflammatory conditions** (Dupuytren's contracture, Ledderhose disease, plantar fasciitis, osteoarthritis, tendinitis)

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Overview of Radiation Therapy

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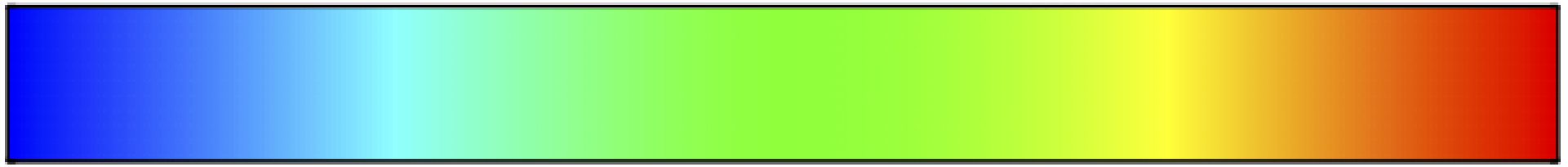
- **High** doses of radiation to cure **cancer**
- **Intermediate** doses of radiation to mediate **cancer-related pain**
- **Lower** doses of radiation to mediate **inflammation** and **fibromatosis**



~3-4 Gy	~15-30 Gy	~30 Gy	~50 Gy	~70 Gy	~80 Gy
Osteo-arthritis	Fibro-matosis	Cancer Pain	Post-Op Breast Cancer	Head & Neck Cancer	Prostate Cancer

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Overview of Radiation Therapy: Cancer-Related Pain

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Intermediate doses of radiation to mediate **cancer-related pain** has been used for **decades** with **good results** (**Grade 1A** recommendation)

SUMMARY AND RECOMMENDATIONS

- **Supportive care** – For all patients with painful bone metastases, supportive care should include adequate analgesia and the use of osteoclast inhibitors to enhance analgesia and reduce the risk of skeletal-related events (including the need for radiation or surgery to bone, pathologic fractures, spinal cord compression, and hypercalcemia of malignancy). (See 'Supportive care' above.)
- **Single or limited number of painful metastases**
  - **External beam RT** – For most patients with a single or limited number of areas of painful bone metastases, we recommend external beam radiation therapy (EBRT) (**Grade 1A**). (See 'External beam radiation therapy' above.)
    - For most patients, we suggest using a single fraction of 8 Gy to the involved area (**Grade 2A**). This approach provides equal palliation with improved patient convenience and cost-effectiveness compared with fractionated schedules, although retreatment is needed more frequently. (See 'Single-dose versus fractionated treatment' above.)
    - For patients with a relatively long life expectancy (six months or longer), a fractionated regimen (such as 30 Gy in 10 fractions or 20 Gy in five fractions) is a reasonable alternative.
    - A transient worsening of pain ("pain flare") occurs in approximately 30 to 40 percent of patients undergoing RT for a painful bone metastasis. Treatment with dexamethasone may reduce the frequency of pain flare. (See 'Time course of relief and incidence of pain flare' above.)
  - **Indications for SBRT** – In our view, stereotactic body RT (SBRT) should be reserved mostly for patients who have persistent or recurrent bone pain after a standard course of EBRT. This view is in keeping with evidence-based guidelines on palliative RT for bone metastases from the American Society for Radiation Oncology.

    One setting in which SBRT may be preferred over EBRT is in the definitive treatment of patients with symptomatic bone metastases from relatively radioresistant neoplasms (eg, renal cell cancer, melanoma, sarcoma), especially in the setting of vertebral metastases with epidural extension but no high-grade epidural spinal cord compression. For patients with oligometastatic bone disease, a controlled primary site, and a long estimated life expectancy, SBRT is also a reasonable approach. (See 'Stereotactic radiation therapy' above.)
  - **Need for surgery** – Surgical consultation for fixation should be obtained prior to the institution of RT for high-risk bone metastases involving the long bones or other weight-bearing bones to treat or prevent a pathologic fracture. In general, we request orthopedic consultation for patients with a Mirels score of 8 or higher (table 1). (See 'Need for surgery' above and "Management of complete and impending pathologic fractures in patients with metastatic bone disease, multiple myeloma, and lymphoma", section on 'Management principles'.)
  - **Persistent or recurrent pain** – Options for patients who have persistent or recurrent bone pain following treatment with EBRT include repeat irradiation with fractionated treatment (especially if single-fraction EBRT was initially used), SBRT, image-guided local thermal ablation, kyphoplasty/vertebroplasty for vertebral compression fractures, or radiopharmaceuticals. (See 'Treatment of recurrent or persistent pain' above.)

    Reirradiation may be indicated if there is an incomplete response to initial treatment or if severe pain recurs and the patient's overall condition permits. Clinical trials data suggest that acceptable regimens include a single fraction of 8 Gy or a brief fractionated regimen of 20 Gy, although the latter can be associated with higher acute toxicity. For selected patients with a good performance status and recurrence in the spine, SBRT is another option, where available. (See 'Stereotactic radiation therapy' above and 'Safety and efficacy of reirradiation' above.)

Kachnic et al., *UpToDate* (2023)

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Overview of Radiation Therapy: Low-Dose

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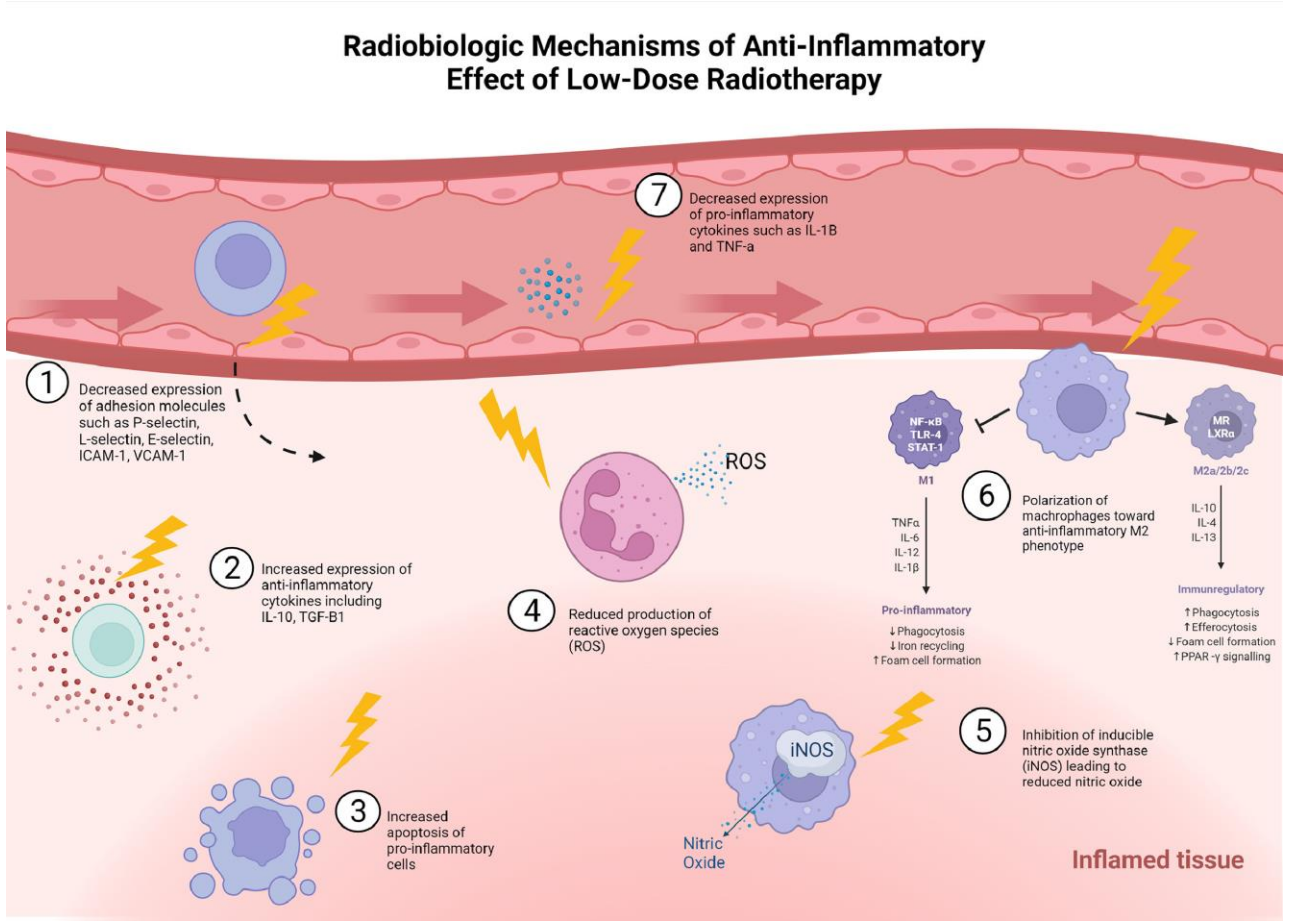
Lower doses of radiation to mediate **inflammation** and **fibromatosis**



Dove et al., *Int J Radiat Oncol Biol Phys* (2022)

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Radiation-Induced Fatal Tumor Risk

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- **Lifetime risk** for an **induced fatal tumor** in patients receiving **low-dose radiation therapy** to the knee with **total dose** of **6 Gy**
  - At **age 25**: 2 in 1,000 (**.2%**)
  - At **age 50**: 0.7 in 1,000 (**.07%**)
  - At **age 70**: 0.3 in 1,000 (**.03%**)
- **Risk** is related to radiation **dose**, **anatomic location**, and **time** interval. Important to consider **age**, **gender**, **anatomic location** (i.e. shoulder and hip may be higher risk due to surrounding nearby organs whereas knee/hands/elbow may be lower risk) and other factors when **evaluating patients** for the **risks / benefits** of low-dose radiation therapy.
- **No known reported cases** of **secondary malignancy** from treatment of **osteoarthritis** with **low-dose radiation therapy.**

Jansen et al., *Radiother Oncol* (2005)
Mucke et al., *Leitlinie Strahlentherapie Gutartiger Erkrankungen* (2020)

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Overview of Musculoskeletal Conditions

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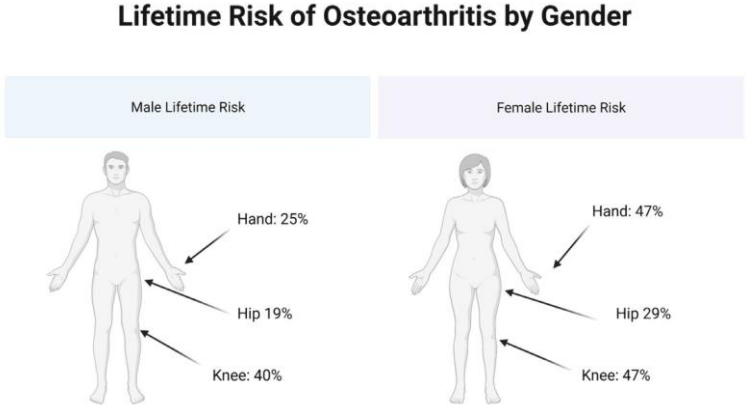
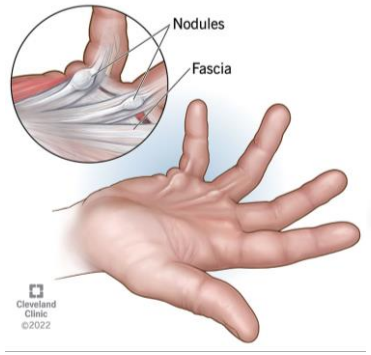
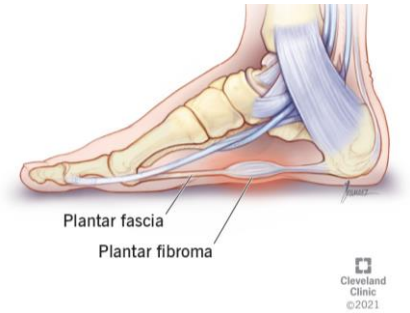
- Osteoarthritis
  - 1 in 7 adults in US (~32.5 million)
  - Knee > hip > hands
  - 2nd most costly health condition in US
- Plantar fibromatosis (Ledderhose disease)
  - Incidence of ~200,000 in US
  - Plantar fasciitis affects ~1 in 10 people in the US
- Palmar fibromatosis (Dupuytren's contracture)
  - Incidence of 3 to 140 per 10,000 adults in US (~70,000 – 3.3 million)







Cleveland Clinic
Centers for Disease Control
Dove et al., *Int J Radiat Oncol Biol Phys* (2022)
Young et al., *Orthop Res Rev* (2019)
DiBenedetti et al., *Hand (N Y)* (2011)

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Plantar & Palmar Fibromatosis Treatment Algorithm

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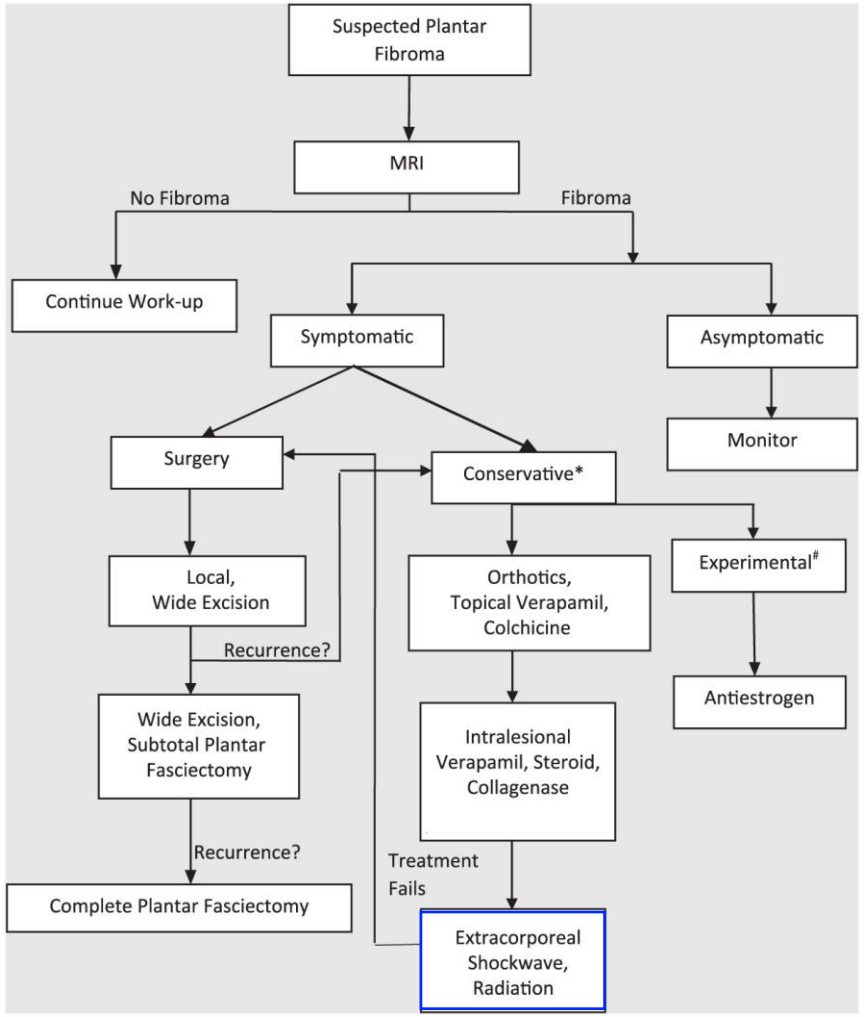

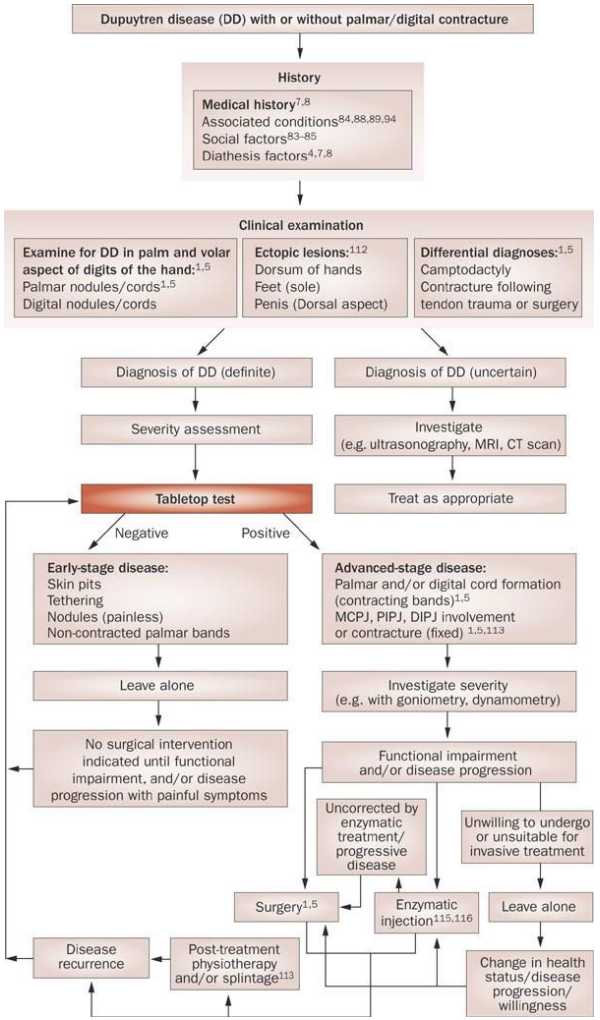

Treatment	Mechanism of Action	Results
Offloading pads	Offloads fibroma with use of orthotics and cut-outs	Does not affect size or progression of fibroma. Provides symptomatic relief
Radiation	Ionizing radiation disrupts TGF-β produced by myofibroblasts during proliferation phase	Requires multiple sessions of radiation during several week periods. 50% of patients report decrease in size of lesion
Extracorporeal shock wave	Exact mechanism of action unknown, possibly directly damages lesion resulting in removal by macrophages	Pain reduction and softening of lesions have been reported as early as 2 weeks after initiation of treatment
Steroids	Decreases expression of VCAM-1 and alters production of TGF-β and bFGF	Reduces size and pain of lesion, however, lesion can reoccur after several years
Anti-estrogen	Decreases contraction rates of myofibroblasts	Currently there are no in vivo studies evaluating its efficacy
Verapamil	Inhibits collagen production and increases collagenase activity	No reported studies published in plantar fibromas, but has been shown to decrease plaque size in Peyronie's disease
Collagenase	Contains 2 types of collagenase AUX-1 and AUX-2, which degrade collagen	Has been shown to decrease contractions in Peyronie's and Duyuptren's. In one case study in plantar fibromas did not show improve of lesion size
Colchicine	Inhibits microtubule polymerization by binding to tubulin	Has not been proven effective, more studies are needed to evaluate efficacy[18-20]

Radiotherapy administered in the early stages of DD can prevent disease progression.[117,118] In a long-term follow-up of radiotherapy applied to early-stage DD (no extension deficit, or total flexion deformity of 1–5°), 70–87% of cases remained stable and showed no progression after 13 years.[118]

Shih et al., *Nat Rev Rheumatol* (2010)
Carroll et al., *Foot Ankle Spec* (2018)

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Plantar & Palmar Fibromatosis Classification

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Early stage where XRT is most beneficial

Table 1
Original staging of Dupuytren disease by Tubiana

Stage	Deformity
0	No lesion
N	Palmar nodule without presence of contracture
1	TFD between 0° and 45°
2	TFD between 45° and 90°
3	TFD between 90° and 135°
4	TFD >135°

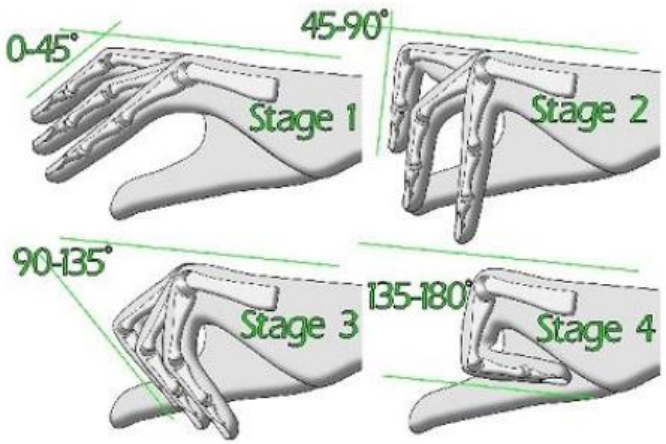

Table Top Test

Patient can't flatten hand

Presume Dupuytren's disease when a patient with a hand nodule or cord is unable to flatten the palm of the hand against a table surface.

Tumor Grade	Description
I	Focal disease isolated to a small area on the medial and/or central aspect of the fascia No adherence to the skin No deep extension to the flexor sheath
II	Multifocal disease, with or without proximal or distal extension No adherence to the skin No deep extension to the flexor sheath
III	Multifocal disease, with or without proximal or distal extension Either adherence to the skin or deep extension to the flexor sheath
IV	Multifocal disease, with or without proximal or distal extension Adherence to the skin and deep extension to the flexor sheath

Hindocha et al., *J Hand Surg Am* (2006)
Sammarco et al., *Foot & Ank Internat* (2000)
International Dupuytren Society
MDedge Family

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Plantar & Palmar Fibromatosis Data

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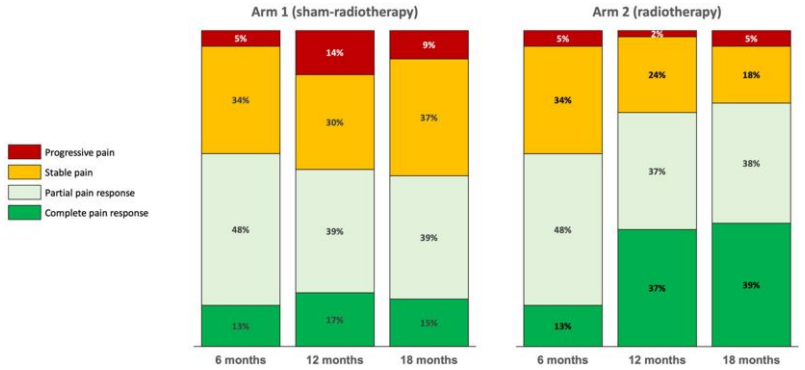
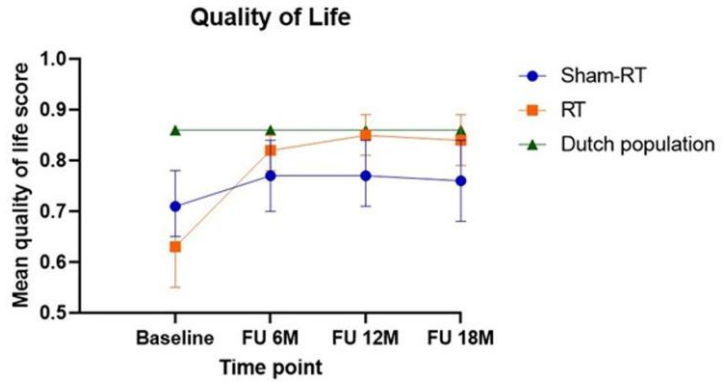
- **LedRad**
  - Phase 3 randomized, multicenter, double-blind for plantar fibromatosis
  - Primary endpoint: Pain reduction at 12mo (complete and/or partial response of 35%)
  - Secondary endpoint: Pain reduction at 6 & 18 months; quality of life; walking ability; toxicity
  - n=84 randomized to XRT (two courses of 15 Gy, separated by 10 weeks) vs sham-XRT (sound-recording of the machine mimicking treatment)
  - **Toxicity**: ↑ **acute dermatitis** with XRT (33% vs 18%)



↓ 12mo **mean pain score** (2.5 vs 3.6; p=0.03) with **XRT**
Cumulative pain response 74% with XRT (vs 56% placebo)



↑ **quality of life** with XRT (p<0.001)

De Haan et al., *Radiother Oncol* (2023)

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Plantar & Palmar Fibromatosis Data

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- **Seegenschmiedt Study**
  - Phase 3 randomized, single center for palmar fibromatosis
  - Primary endpoint: Clinical progression (nodules/cords) and necessity of salvage surgery
  - Randomized to observation (no XRT) vs XRT (21 Gy in 7 fractions) vs XRT (two courses of 15 Gy, separated by 8 weeks)
  - Tubiana classification: N=nodules/cords without extension deficit (65.5%), N/I=≤10° deficit (17%), I=11-45° deficit (15%), II=46-90° deficit (2.5%)
  - Initial study n=129 then expanded to total of n=489 (mean follow-up 8.5 years, range 5-13 years)
  - **Progression**:
    - Clinical and surgery: 62% and 30% (observation) vs 24% and 12% (XRT – 21 Gy) vs 19.5% and 8% (XRT – 15 Gy two course) ($p<0.0001$)
  - **Toxicity** with **XRT**:
    - Acute grade 1 of 26.5% and acute grade 2 of 2.5%
    - Late grade 1 of 14%
    - No in-field secondary cancers noted at long-term follow-up

Seegenschmiedt et al., *Int J Radiat Oncol Biol Phys* (2001)
Betz et al., *Strahlenther Onkol* (2010)
Seegenschmiedt et al., *Dupuytren's Disease and Related Hyperproliferative Disorders* (2011)

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Osteoarthritis Treatment Algorithm

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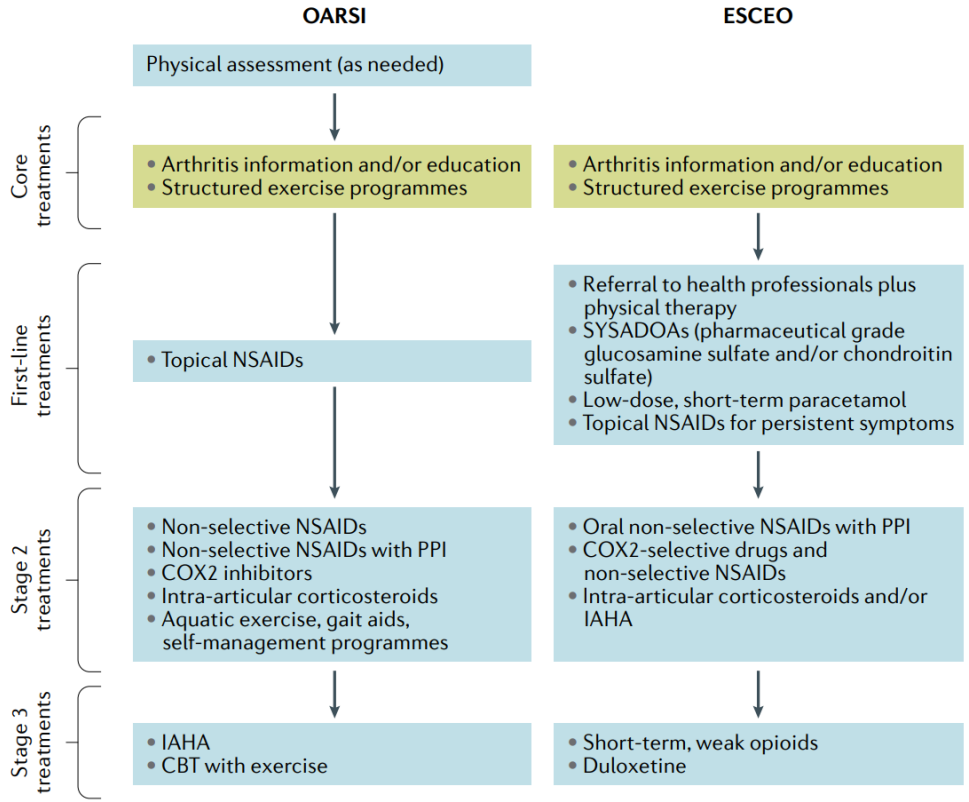

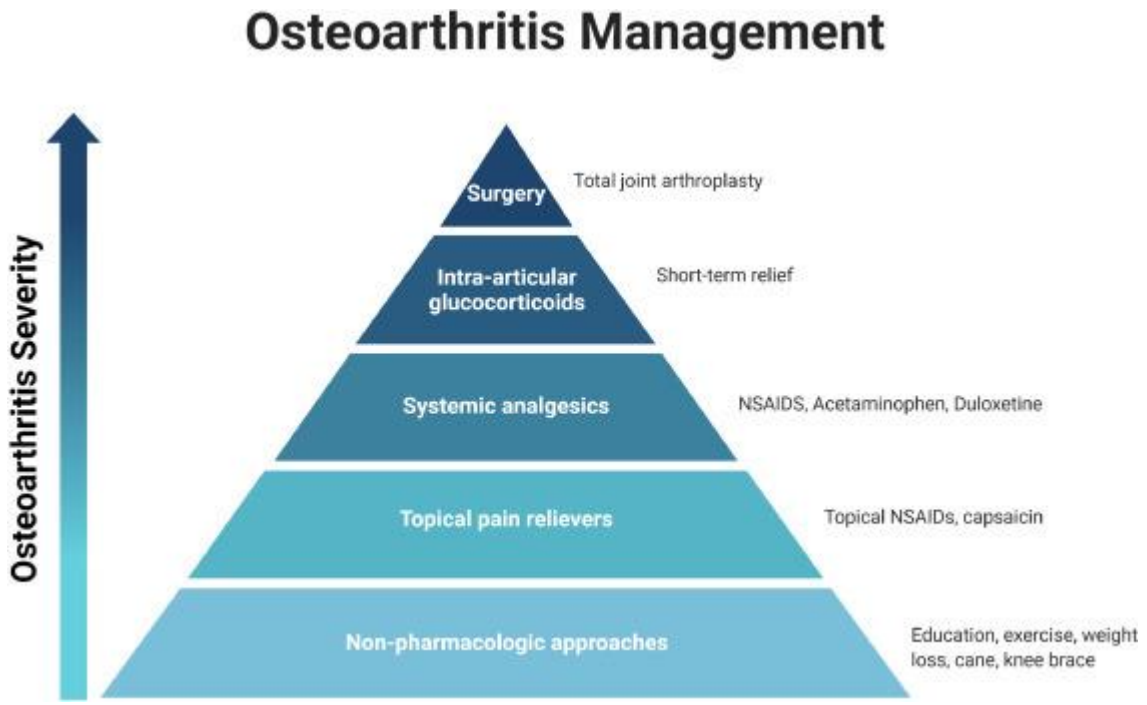

Arden et al., *Nat Rev Rheumatol* (2021)
Dove et al., *Int J Radiat Oncol Biol Phys* (2022)

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Osteoarthritis Treatment Algorithm

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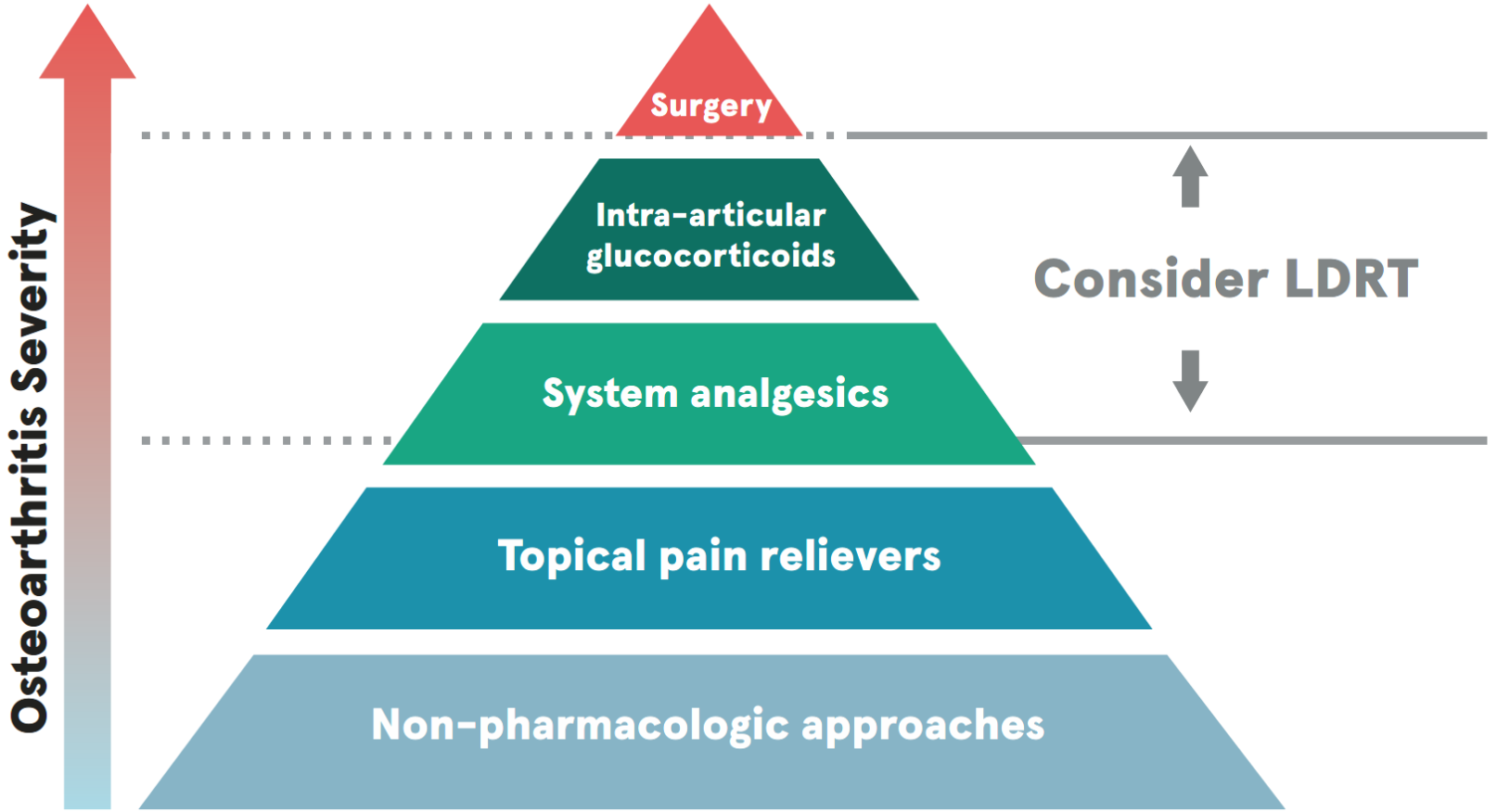

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Trends Over Time

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- **First osteoarthritis** patient **treated** in **US** was in **1906.**
- **Common** condition treated **until 1980s** due to **improved pharmacologic treatment options** and **negative trial data.**
- **Physician survey** in **1998** demonstrated **<10%** in **US** using **radiation therapy** for **osteoarthritis** compared to **>85%** in **Europe.**

Negative randomized trials in 1970 and 1975

- x Mixed types of arthritis, minority had osteoarthritis (n=125/399 and n=40/104)
- x Not low-dose radiation therapy (≥100 cGy/fraction) as currently used
- x Use of non-modern radiation techniques and approaches

Leer et al., *Radiother Oncol* (1998)
Goldie et al., *Acta Radiol Ther Phys Biol* (1970)
Valtonen et al., *Scand J Rheumatol* (1975)

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Germany Society of Radiation Therapy Oncology: Level of Recommendation

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- Germany Cooperative Group in Radiation Therapy for Benign Disease (**GCG-BD**) – **review decades of German clinical experience using radiation for non-malignant disorders.**
- **Update** in **2018** included **levels of recommendation** for different **treatment sites** based on current data.
- **Overall** data demonstrated **symptomatic pain relief 60-90%** with **essentially no side effects.**

Table 3 Overview of indications and DEGRO level of recommendations for LDRT for musculoskeletal disease

Suggested criteria for treatment with LDRT for OA	
Appropriate after the exhaustion of other medical interventions or before more aggressive interventional treatments such as joint replacement (if more conservative treatment is desired)	
Older than age 40	
No known contraindications to radiation (pregnancy, active connective tissue disorder)	
2018 DEGRO level of recommendation	
Knee OA	Level recommendation B
Hip OA	Level recommendation C
Hand OA	Level recommendation C
Ankle OA	No level recommendation given
Shoulder OA	Level recommendation C
Plantar fasciitis	Level recommendation A
Elbow syndrome	Level recommendation B

Abbreviations: DEGRO = German Society of Radiation Therapy and Oncology; LDRT = low-dose radiation therapy; OA = osteoarthritis.

Mucke et al., *Leitlinie Strahlentherapie Gutartiger Erkrankungen* (2020)
Dove et al., *Int J Radiat Oncol Biol Phys* (2022)

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Osteoarthritis Modern Prospective Data

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Table 1

Reference	Study design (sample size)	Site	Total dose/dose per fraction (percentage of joints)	Fractionation schedule	Reirradiated (time after initial treatment)	Pain scoring	Follow-up	Outcome	Treatment device
Alvarez et al (2021)[88]	Prospective (n = 100)	Hand	6.0 Gy/1.0 Gy (83%); 3.0 Gy/0.5 Gy (17%)	3 fractions per week for 2 wk	50.4% (median 12 wk)	VAS	10.5 mo (median)	94% response at 12 mo	Linac
Donaubauer et al (2021)[53]	Prospective (n = 125)	Multijoint	3.0 Gy/0.5 Gy	6 fractions over 3 wk	61.6% (3 mo)	VAS	6 mo	Planned interim analysis: reduction in mean VAS from 6.5-3.8 at 6 mo	Orthovoltage
Rogers et al (2020)[89]	Prospective (n = 99)	Fingers	4.0 Gy/0.5 Gy	Twice weekly for 4 wk	81.8% (2-12 mo)	VAS	12 mo	Reduction in VAS during activity by 3.0 (median) at 12 mo	Orthovoltage
Koc et al (2019)[90]	Prospective (n = 16)	Knee and hip	6.0 Gy/1.0 Gy	6 fractions given over 2 wk	0%	NRS	52 wk	50% response rate at 6 wk; 25% response rate at 52 wk	Linac
Micke et al (2018)[66]	Prospective (n = 703)	Multijoint	6.0 Gy/0.5 Gy (84.8%); 6.0 Gy/1.0 Gy (15.2%)	Not reported	7.3% (3 mo)	VAS and VPS	33 mo (median)	Reduction in mean VAS from 7.0-4.5 at the end of RT; 37.6% response rate at end of RT; 58.4% response rate at 33 mo	Linac orthovoltage
Micke et al (2017)[91]	Prospective (n = 166)	Multijoint	6.0 Gy/0.5 Gy (77.8%); 6.0 Gy/1.0 Gy (22.2%)	Not reported	8.4% (3 mo)	VAS and VPS	29 mo (median)	Reduction in mean VAS from 6.38-4.49 at the end of RT; 37.3% response at end of RT; 49.6% response at 29 mo	Linac orthovoltage

Review of several studies (>1,000 patients), only **1 patient** reported **mild skin erythema.**

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Dove et al., *Int J Radiat Oncol Biol Phys* (2022)

Osteoarthritis Modern Prospective Data

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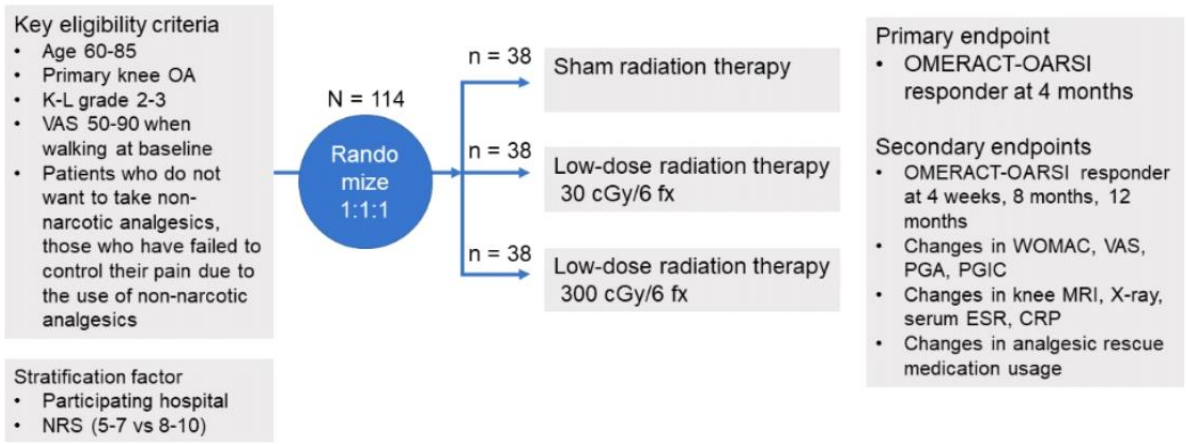
- **Kim LoRD-KNeA Study**
  - Randomized, multi-institutional trial sham XRT vs 0.3 Gy/6 fractions vs 3 Gy/6 fractions
  - Osteoarthritis of the knee (n=114) based on Kellgren-Lawrence criteria
  - No repeat course of XRT allowed
  - Primary endpoint of response rate at 4 months based on the Outcome Measures in Rheumatology-Osteoarthritis Research Society International (OSMERACT-OARSI) scale



- **Responder rate** at **4 months**
  - ↓ **in pain** of **70%** in **3 Gy arm** vs 42% in sham arm (p=0.014); ↓ in pain of 58% in 0.3 Gy arm (p=0.157)
  - Western Ontario and McMaster Universities Osteoarthritis (WOMAC) **clinically meaningful improvement** in **pain index** noted **more frequently** in **3 Gy arm** (**57%**) vs sham arm (31%; p=0.024)

Kim et al., ASTRO Abstract (2025)

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Osteoarthritis Modern Prospective Data

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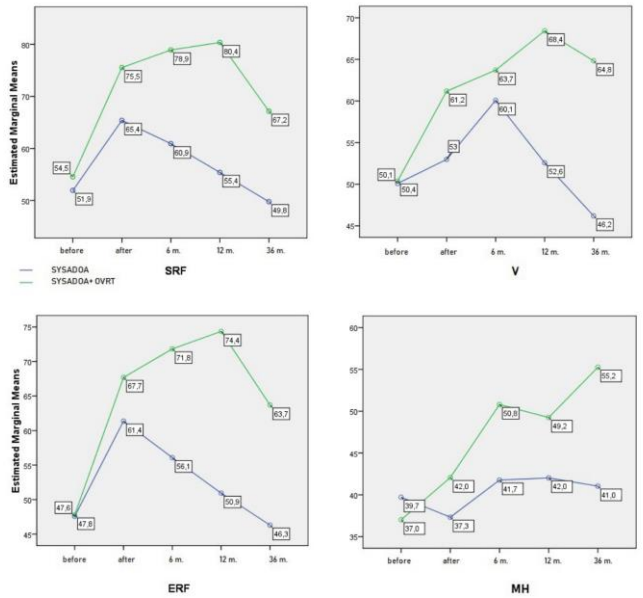
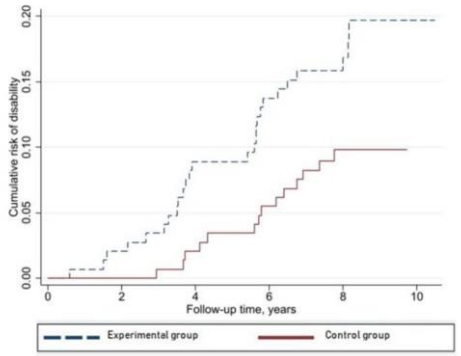
- **Makarova Study**
  - Randomized, multi-institutional trial of glucosamine + chondroitin vs glucosamine + chondroitin + low-dose radiation
  - Osteoarthritis of the knee (n=292) based on Altman and Kellgren-Lawrence criteria (including MRI)
  - Radiation given at 0.45 Gy/fraction for total dose of 4.5 Gy (total 10 fractions)
  - Clinical response using the SF-36 quality-of-life scale, visual analog scale, & radiographic imaging

↑ **Quality of life** with **XRT** at 1-3 years (social role function, vitality, emotional role function, mental health)





↓ **Cumulative disability** with XRT (p=0.030)

↓ **Knee arthroplasty** (4% vs 8%)

MRI findings with **improved cartilage thickness**, **less bone marrow edema**, **less articular surface thinning** with XRT

Makarova et al., *Diagnostic Radiology and Radiotherapy* (2019)
Makarova et al., *Russian Open Medical Journal* (2021)
Makarova et al., *Acta Biomedica Scientifica* (2023)

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Osteoarthritis Modern Prospective Data

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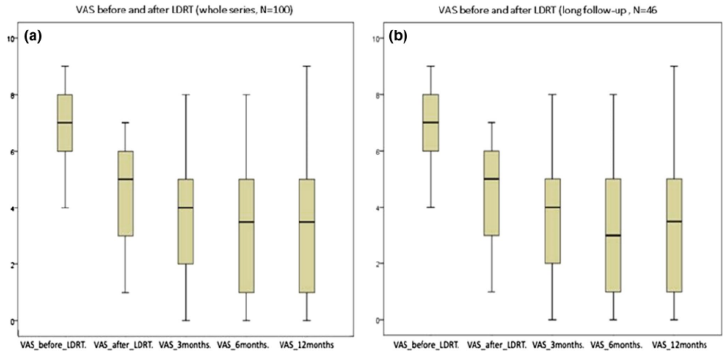
- **Alvarez Study**
  - Prospective study of patients with osteoarthritis of the hand(s)
  - n=100 patients → 57% PIP/DIP, 40% thumb, 2% radiocarpal, 1% MCP
  - Radiation given in 6 fractions (0.5-1 Gy/fraction) every other day for total dose of 3-6 Gy
  - Second round of treatment in those who did not achieve pain relief after 8 weeks
  - Response evaluated using visual analog scale for pain & von Pannewitz score for joint functionality
    - Median follow-up of 10.5 months (7.6-12.5)
      - **94%** reported ↓ **in pain** after 3 m/o, 6 m/o, and 12 m/o ($p<0.001$)
      - **Median pain** score of **8** (range: 3-10) **before** → Median pain score of **5** (range: 1-10) **after**
      - **70%** reported ↑ **functionality**
      - **63%** required **second course** due to inadequate initial response
      - **0** acute or late **complications**



Median pain score at 3 m/o, 6 m/o, & 12 m/o of 4 (range: 0-9), 3 (range: 0-9), & 3.5 (range: 0-9), respectively ($p<0.001$)

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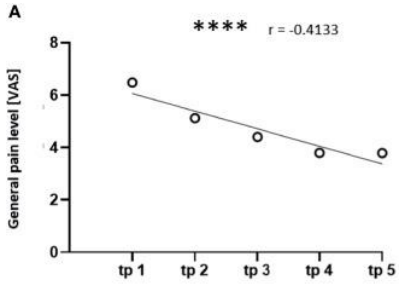
Alvarez et al., *Clin Transl Oncol* (2022)

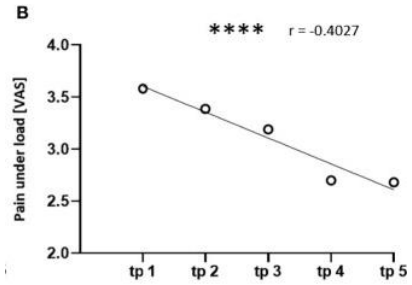
Osteoarthritis Modern Prospective Data

Boulder Community Health

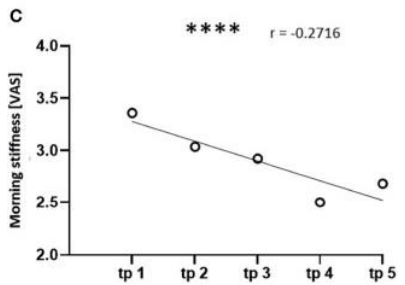
- **Donaubauer Study**
  - Prospective study IMMO-LDRT01 evaluating immunological mechanisms of low-dose radiation
  - Inflammatory condition (i.e. osteoarthritis, tendinitis) of any body site
  - Radiation given in 6 fractions (0.5 Gy/fraction) over three weeks to total dose of 3 Gy
  - Second round of treatment allowed for patients who did not achieve pain relief
  - Clinical response evaluated using visual analog scale for pain
  - Interim analysis of first 125 patients (planned n=250, still accruing)



↓ median **general pain**
Mean score 6.5 before vs score 3.8 after (p<0.0001)



↓ median **load bearing pain**



↓ median **morning stiffness pain**

Donaubauer et al., *Front Immunol* (2021)

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Osteoarthritis Modern Prospective Data

Boulder Community Health

- Ongoing **IMMO-LDRT01** Prospective Clinical Trial (**Germany**)
- Ongoing **RAGOCO** Randomized Clinical Trial (**Spain**)
- Ongoing **LoRD-KNeA** Randomized Clinical Trial (**Korea**)

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Other Institutions

Boulder Community Health

- **Cleveland Clinic**
- **City of Hope**
- **UCLA**
- **University of Pennsylvania**
- **University of Pittsburgh**
- **Banner Health**

Democracy Dies in Darkness

Low-dose X-ray treatment is being used for arthritis, plantar fasciitis and other benign conditions

Doctors who use it say the treatment is effective and the low dosage means little radiation exposure

August 3, 2025

By Caitlin Carlson

https://www.washingtonpost.com/health/2025/08/03/low-dose-radiation-therapy-ldrt-arthritis/

Cleveland Clinic
https://consultqd.clevelandclinic.org › low-dose-radiatio...

Low-Dose Radiation Therapy Reemerging for Osteoarthritis

Nov 7, 2023 — **Cleveland Clinic radiation** oncologists have started a **low**-dose **radiation** treatment program for patients with **osteoarthritis**.

City of Hope
https://www.cityofhope.org › departments-and-services

Low-Dose Radiation Therapy for Osteoarthritis | City of Hope

UCLA Health
https://www.uclahealth.org › cancer › radonc › treatments

LDTR for Osteoarthritis - Radiation Oncology

Low-Dose Radiotherapy (LDRT) is a non-invasive, anti-inflammatory treatment that **uses very low doses of radiation** to reduce pain and improve joint function in ...

Penn Medicine
https://www.pennmedicine.org › december › low-dose-ra...

Low-dose radiation therapy for osteoarthritis

Dec 11, 2024 — **Low-dose radiation is an alternative treatment** for patients who haven't really responded to those more standard measures.

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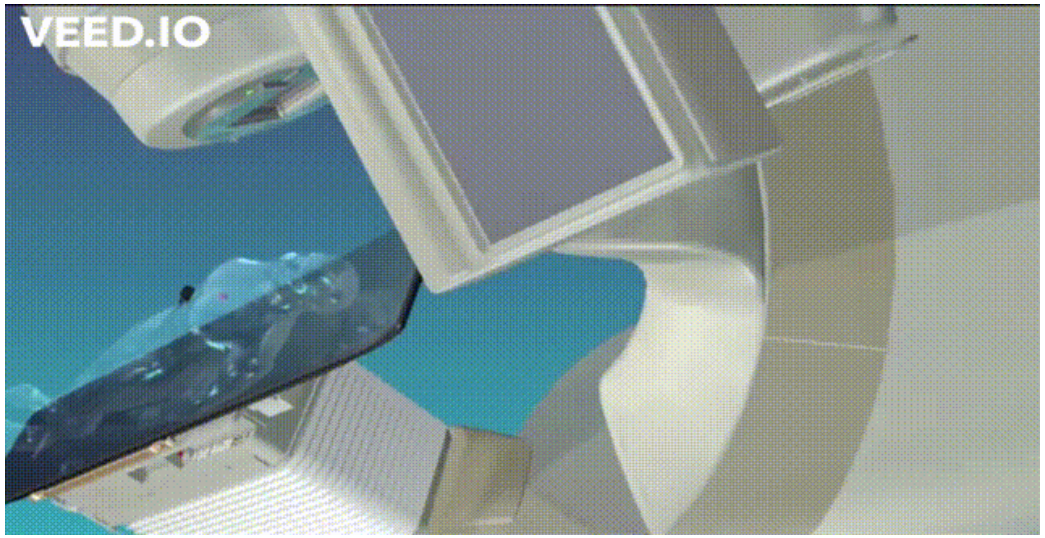
Radiation Therapy Details

Boulder Community Health



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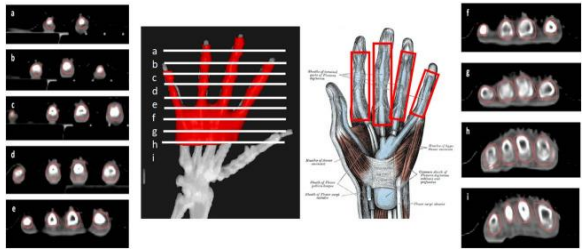
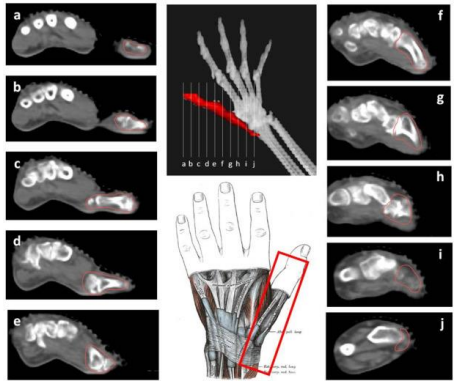
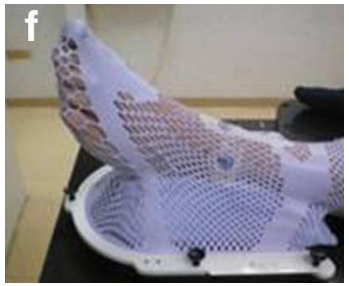
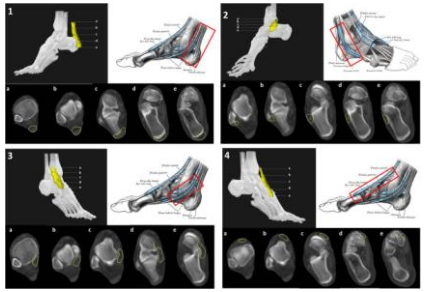
Radiation Therapy Details

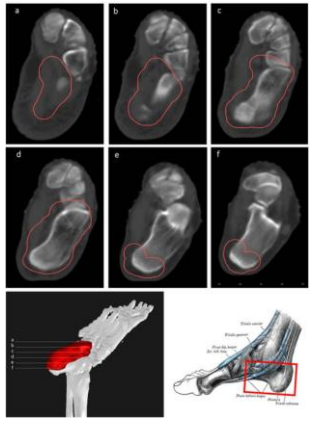
Boulder Community Health

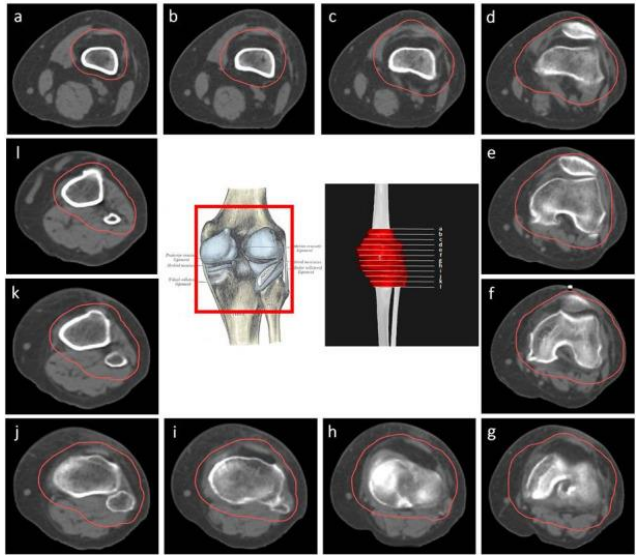












Yu et al., *Pract Radiat Oncol* (2024)
Alvarez et al., *Br J Radiol* (2021)

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Convenient Locations

Boulder Community Health

Aurora Radiation

1700 S. Potomac St.
Aurora, Colorado 80012

Street View

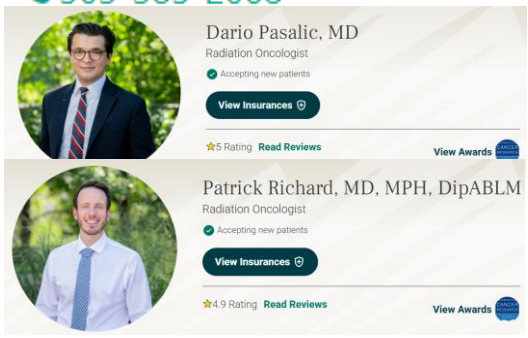
303-418-7659

Boulder Radiation

4715 Arapahoe Ave.
Boulder, Colorado 80303

Street View

303-385-2068



Littleton Radiation

22 W. Dry Creek Cir.
Littleton, Colorado 80120

Street View

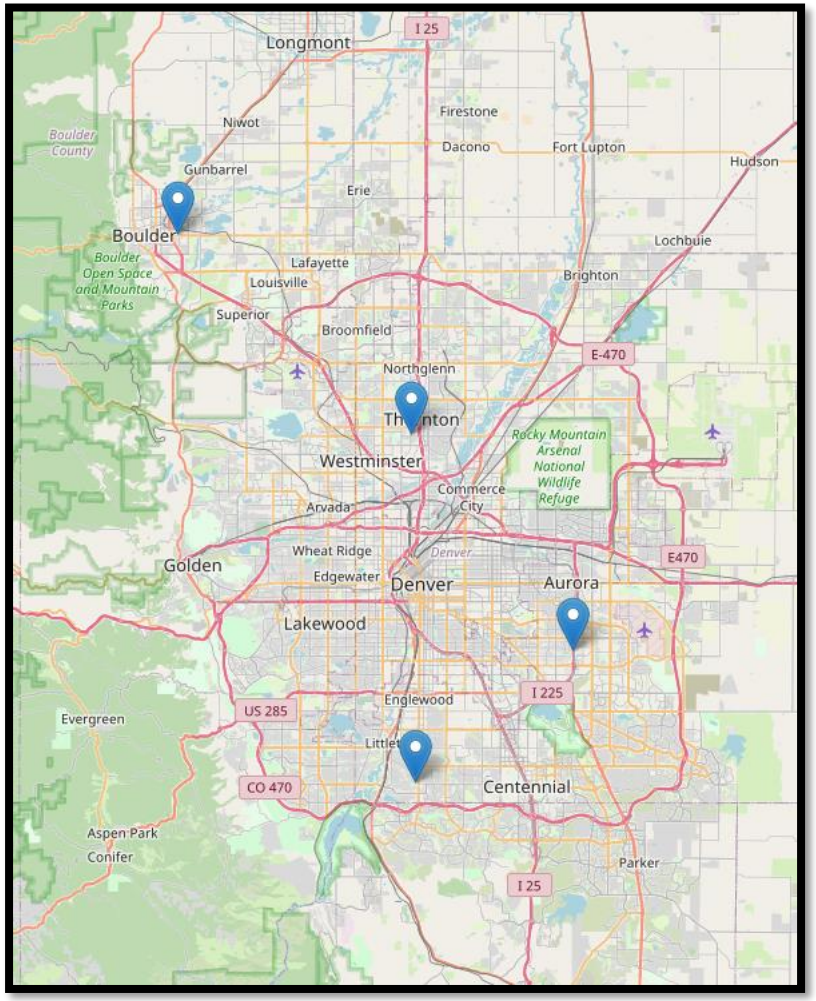
303-730-4700

Thornton Radiation

8820 Huron St.
Thornton, Colorado 80260

Street View

303-386-7622



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Summary

Boulder Community Health

- **Low-dose radiation therapy** can be used for a variety of **inflammatory conditions** including osteoarthritis, tendinitis, plantar fasciitis, palmar fibromatosis (Dupuytren's contracture), plantar fibromatosis (Ledderhose disease) based on phase III (randomized) and phase II (prospective) data.
- **Treatments are minimally invasive** (no injections or changes in patient routine), **short** (6-12 sessions depending on response), and **convenient** (20 min per session, 4 RMCC locations throughout metro area).
- **Minimal side effects** (1 patient, out of >1,000 reviewed, experienced skin erythema; risk of secondary malignancy <0.1% in appropriately selected patients).
- **Consider patients** who are in **early-to-mid disease course** (severe contracture for fibromatosis or severe bony erosion with osteoarthritis less likely to benefit from radiation and more likely need surgery) and **age ≥50.**

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Patient Testimonial

Boulder Community Health

- Linda Wanamaker
- Left knee arthritis treated in January
- Will share experience at Rocky Mountain Cancer Centers

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Thank You!

Boulder Community Health

Questions?

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Low Dose Radiation Therapy for Benign Conditions

Dario Pasalic, MD
Patrick Richard, MD, MPH, DipABLM
Rocky Mountain Cancer Centers
720-764-9276

Boulder Community Health

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