CLINICAL ARTICLE

Radiotherapy for Ledderhose Disease of the Foot

Dr Richard Shaffer

1. Radiotherapy for Benign Diseases

Radiotherapy is the medical use of X-Rays and other forms of ionising radiation to treat disease. It is mostly used to treat cancer, but due to its anti-inflammatory and anti-proliferative effects it is also used to treat benign disease. For example, the anti-proliferative effect of radiotherapy can be used to reduce the risk of heterotopic ossification following hip replacement, and the anti-inflammatory effect can be used for the treatment of thyroid eye disease. The doses of radiotherapy used for the treatment of benign conditions are generally below the range used to treat cancer, and so for most patients acute toxicity is not a problem. The use of radiotherapy for benign disease widely varies between different countries, but its use is particularly prevalent in Germany, as seen in a study from 134 German institutions surveyed in 1994 – 96, which showed that approximately 20,000 patients were treated for benign conditions annually, with 146 of these being for Dupuytren's disease [Seegenschmiedt, (2000)].

The Author
Dr Richard Shaffer, Consultant Clinical Oncologist, Royal Surrey County Hospital, Guildford.
www.thedupuytrenspractice.com

2. Ledderhose Disease – An Overview

Ledderhose disease (plantar fibromatosis) of the foot is a benign proliferative disorder of the plantar fascia. It forms part of a group of fibromatoses that also includes Dupuytren's disease (palmar fibromatosis), Peyronie's disease (penile fibromatosis). The causes of these diseases are unknown, but they appear to have a genetic component. Additional risk factors include trauma to the foot, epilepsy and anti-epileptic use, diabetes mellitus, smoking, and alcoholism. Ledderhose disease (plantar fibromatosis) is less common than Dupuytren's disease, although the two conditions coexist in 20-30% of cases. Typically onset is in the 4th and 5th decades, and presents as lumps attached to the central and medial part of the plantar fascia (Figure 1, below), which may cause discomfort and difficulty with walking and fitting shoes. Rarely, contractures of the toes occur.

Figure 1: Image of Ledderhose disease

3. Treatment of Ledderhose Disease

a. Treatment options overview

The overall treatment options are outlined in the information box (Figure 2, below). Many plantar fibromas are asymptomatic and may not need specific treatment. All patients should be counselled on general care, including well-fitting shoes, and ways of relieving direct pressure on painful nodules. Non-invasive treatments include physiotherapy, orthotics and local steroid injections. Surgical treatments range from lumpectomy or wide local excision to subtotal or radical fasciectomy with or without skin grafting. Surgical outcomes have been reported in small numbers of patients, with 30 or fewer patients in each series, with a significant chance of post-operative complications such as wound healing problems, chronic pain and poor functional outcome.

Outline of treatment for Ledderhose disease:

- General care:
  - Avoid direct pressure on nodules
  - Stretching
  - Soft inner soles, custom orthotics, padding
- Medical treatment:
  - Radiotherapy (see Fig. 2)
  - Steroid injections or ointments
- Surgery
  - Excision of nodule – 85% recurrence rate
  - Radical plantar fasciectomy with skin grafts – morbid, variable results, last resort – 25% recurrence
  - High risk of severe side-effects e.g. painful scars, numbness, haematoma, infection, delayed wound healing.

Figure 2: Outline of Ledderhose disease treatment

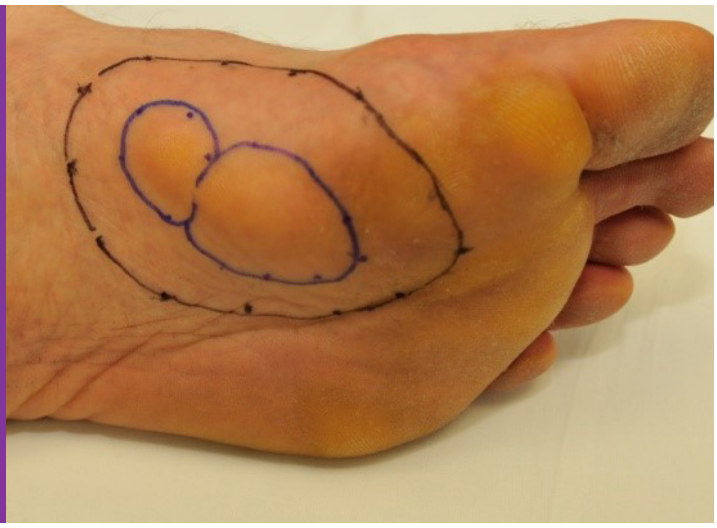

Figure 3: Ledderhose disease and radiotherapy treatment field outlined

b. Radiotherapy for Ledderhose Disease

i. *Indications*

Many patients that have asymptomatic small nodules that do not need any treatment apart from conservative measures. Patients that do need treatment include those with:

- Painful or growing nodules
- Reduction in ability to stand due to nodules
- Reduction in mobility due to the nodules
- Inability to fit shoes due to the nodules

ii. *Radiotherapy details*

- Shielded uninvolved areas with lead
- Patient sitting or lying prone

The aim is to treat the full depth and extent of the nodules. The depth may be measured clinically or with ultrasound. Superficial/ orthovoltage X-rays at e.g. 80 – 150 kV, or electrons (approximately 4 - 6 MeV with appropriate bolus) can be used with appropriate depth-dose calculations. There is no evidence of a difference in effectiveness between these two treatments. Margins of approximately 1 - 2 cm on detectable nodules should be used (Figure 3). The dose is 30 Gy in 10 fractions, consisting of two phases of 15 Gy in 5 fractions with a gap of 12 weeks between the two phases (Figure 3).

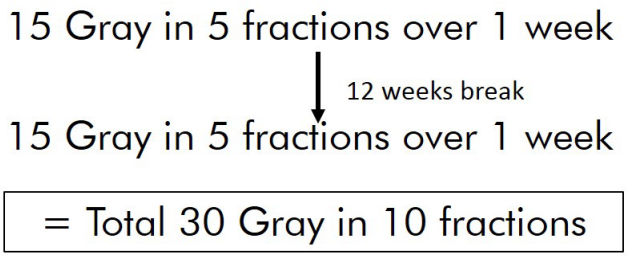

Figure 4: Dose Information diagram

iii. *Radiotherapy Effectiveness and Side-effects*

The best study on the effectiveness of radiotherapy (RT) for Ledderhose disease was a prospective non-randomised cohort study looking at 158 consecutive patients (with 270 affected feet) presenting to a single institution with symptomatic disease that had progressed over the last 6 - 12 months [Seegenschmiedt, (2012)]. Of these, 91 patients (136 feet) decided to undergo radiotherapy and 67 patients (134 feet) did not, and served as a control group. Most were treated with 125 - 150 kV photons at 40cm FSD. The PTV was palpable disease with a 2 cm safety margin. The dose delivered was 15 Gy in 5 fractions over one week, with a further 15 Gy in 5 fractions repeated after 12 weeks for a total dose of 30 Gy in 10 fractions. At a mean follow up of 68 months, in the irradiated group 92% had either stable disease or at least a partial response (SD/PR), with only 8% showing progressive disease (PD) and 5% needing salvage surgery. In the control group 62% had SD/PR and 38% had PD, with 21% needing surgery. In the irradiated group, symptoms were improved in 79%, compared with 19% in the control group. Acute side-effects were seen in 26.5% (21.3% grade 1, 5% grade 2), with grade 1 chronic changes (dryness or fibrosis) in 16.2%.

	RT	Control
Symptoms improved	79%	19%
Less pain on walking	83%	4%
Less pain at rest	68%	17%
Improved walking	73%	12%

Table 1: Symptomatic relief with Radiotherapy

	RT	Control
Complete Response	26%	0%
Good Partial Response (>50%)	22%	7%
Stable Disease or Partial Response (25-50%)	44%	55%
Progression	8%	38%

Table 2: Overall change in nodules with Radiotherapy

4. Conclusion

Radiotherapy is safe and effective in symptomatic Ledderhose disease at shrinking nodules, and increasing function and reducing associated pain.

5. References

Seegenschmiedt MH, Katalinic A, Makoski H-B et al. Radiation therapy for benign diseases:patterns of care study in Germany. Int J Radiat Oncol Biol Phys 2000; 47: 195-201.

Seegenschmiedt MH, Wielputz M, Hanslian E, and Fehlauer F. Long-term outcome of radiotherapy for primary and recurrent Ledderhose disease. In: Eaton C, Seegenschmiedt MH, Bayat A, et al. (eds). Dupuytren's disease and related hyperproliferative disorders. Springer 2012. 409-427.