Factors for Consideration in the Choice of a Linear Accelerator or a Superficial X-Ray Unit for Treatment of Dupuytren's Disease or Ledderhose

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1. Introduction

Consideration of operational flexibility and costs should be useful in facilitating the decision making process for choice of a radiotherapy treatment system for Dupytren's Disease (DD) and Ledderhose. As these parameters should be key components in system selection, these will now be considered.

2. Method

Different modalities of radiation therapy are used in clinical practice, but there is no robust evidence or consensus on the treatment delivery method. For Treatment for DD and/or Ledderhose treatment and operational aspects of alternative types of equipment will be considered, as follows: Electron beam radiation therapy (EBRT), delivered by a linear accelerator (linac), uses high-energy electrons in the range of 4 – 20 MeV. EBRT is well suited to skin treatment due to the rapid decrease of dose in tissues.2,5 However, this follows a dose build-up region and application of a tissue equivalent bolus material over the treatment area is usually required to move to the maximum dose of radiation to the skin's surface and to reduce the beam penetration to underlying tissues. Superficial X-ray therapy (SXRT) uses lower energy (e.g. 100kV X-ray) photon beams to deliver energy relatively superfically without bolus. Due to its relatively small size compared with a linac, it can also provide more flexibility in positioning a treatment beam and the use of bolus material is not required, simplifying the treatment dosimetry. While numerous reports have described treatment outcomes using linac-based treatment delivery, to date there have been fewer discussing SXRT units1. Capital costs of treatment room construction, equipment purchase, maintenance and staffing are also key considerations.

3. Results

There is less literature on the efficacy of SXRT than linacs for the treatment of benign diseases, however, available reports suggest that SXRT is as effective and as safe as linac electron beam delivery, perhaps even more so.
An SXRT unit also more readily permits direct use of ancillary systems, such as a thermal imager in close proximity to the patient and it also facilitates the direct application of shielding to delineate a treatment field area (ref.1)
Comparison of equipment related and staffing costs also shows significant savings, as follows:


Linear Accelerator

Superficial X-ray unit

Equipment Capital Cost (£):	*Linear accelerator 2,000,000;*	*Superficial X-ray unit 200,000*
Annual maintenance cost (£):	*160,000 ;*	*16,000*
Radiographer (treatment) staff (FTE):	4;	2
Physicist (Dosimetry QA, etc.) staff:	1;	0.1
Treatment room requirements:	*Concrete bunker;*	*Room with lead lining*

4. Summary and Conclusions

• An SXRT unit is as suitable for treatment of DD or Ledderhose as a linear accelerator from a dosimetry perspective
• An SXRT unit offers greater flexibility in its use • Costs associated with an SXRT unit are significantly lower
• If a treatment centre has a significant DD or Ledderhose workload, an SXRT unit should be the treatment unit of choice

References *1*. Liu EK, Cohen RF, Chiu ES. Radiation therapy modalities for keloid management: A critical review. J Plast Reconstr Aesthet Surg. 2022;75(8): 2455-2465. doi: 10.1016/j.bjps.2022.04.099