A 15 Year Single Centre Audit of the Outcome of Fractionated Superficial X-Ray Radiotherapy Treatment of Recurrent Keloid Tumours

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Background:

For patients who have experienced a keloid recurrence at a site previously treated by surgery and radiotherapy, the efficacy of a further course of radiotherapy for treatment of this recurrence has not been previously reported as a distinct study outcome.This study reports such results.

The results of two series of long−term audits of recurrence rates of keloid tumours, following surgical excision of the keloid and administration of a single (10Gy) dose of superficial X−ray radiotherapy (SXRT) within 24 hours, have previously been reported in 2003(ref.1) & 2022 (ref.2).The study period for the second series of patient treatments has now been extended to January 2025 and, during this entire second series, keloid recurrences were re−treated with fractionated SXRT. The outcome of this re−treatment is now reported.

Methods:

Outcomes of patient treatment of keloid tumours between 2010 and 2020, by surgical excision then SXRT within 24 hours,have previously been reported (refs.2& 3).This recurrence study has now been extended to January 2025 and recurrence results over a 15 year period derived (see Table 1). For this treatment regime of 10Gy in one fraction (1#), the Biological Effective Dose(BED), using $\alpha/\beta=3$ for skin,is43.3 Gy_3

Following a patient reporting a keloid recurrence, re−treatment was undertaken with fractionated SXRT only and usingthe following protocol: 4Gy administeredin 4#at 3 monthly intervals to a maximum dose 16Gy over 12 months. Treatment was discontinued after 4Gy, 8Gy or 12Gy if, at review,a successful outcome had been achieved at this dose. Here the BED3 is 9.3Gy_3 for 1#,and, assuming moderate tissue repair, 12.6Gy_3 for 2#, 13.7Gy_3 for 3# and 14.1Gy_3 if the full 4# course of treatment were to be delivered over a 12 month period.

Recurrences were usually small and the results of employing this radiotherapy re−treatment regime for a patient recurrence are summarised below (see Table 2).

Results:

Table 1 – Keloid Recurrence Rate Post Surgery and SXRT (2010–2025)

1. Centre	2. Dose (Gy)	3. SXRT Treatment	4. Patients: Number& Gender	5. Number of Keloids	6. Outcome at 4–6Week Post Treatment Review	7. % Relapse Rate After 1 year	8. % Relapse Rate After 5 years
Cancer Centre London 2010 – 2025 (January)	10Gy in 1 fraction	60kV, 100kV, or 160kV X-ray beam	87 patients 66% (F) 34% (M)	158 keloids	100% (158 keloids) Free from recurrence	6.8% (for 148* keloids)	14.7% (for102† Keloids)

* 10 keloids treated within previous year; †56 keloids treated within previous 5 years
For entire patient cohort (158 keloids): 23 (14.6%)relapsed during the 15 year period

Notes:

1.Minimal skin reaction – reddening /itching and/or pigmentation change for 6 –12 months

2. No cancers recorded

3. Time Period before Relapse: 3.5 months to 10 years

4. Mean Follow–Up Period:7years 6months (Minimum: 1 month; Maximum: 15 years)

Table 2 – Outcome of Keloid Recurrence Re–Treatments by Fractionated SXRT (2010–2025)

1. Centre	2. Dose (Gy)	3. SXRT Treatment	4. Patients: Number& Gender	5. Number of Keloids	6. Outcome at Quarterly Treatment Review Before Next Planned Fraction	7. % Relapse* Rate After 1 year	8. %Relapse* Rate After 5 years
Cancer Centre London	4Gy at 3 monthly intervals: Maximum dose 16Gy (i.e.4Gy/4#) over 12 months	60kV, 100kV, or 160kV X-ray beam	14 patients 50% (F) 50% (M)	23 keloids	Treatment discontinuedafter 2# or 3#in ~ 50% of patients: further treatment not required	None but for16Gy (4#/1yr)patient treatments: response ongoing& outcome yet tbc	None requiring further re-treatment: patients satisfied with outcome†

* Hallmarks of recurrence – keloid regrowth;itching; red, shiny skin: not present
\+ Patients satisfied with treatment outcome, though minority had residual skin thickening

Notes:

1. *Minimal skin reaction – reddening /itching and/or pigmentation change for 6 –12 months*
2. *No cancers recorded*
3. *Mean Follow–Up Period:6years 8months (Minimum:1month;Maximum:13years 4months)*

An attempt was made to compare the results of this radiotherapy treatment regime with re–treatment results reported when either different doses and/or different fractionation or different radiotherapy modalities (i.e. a linear accelerator electron beam or brachytherapy) were employed. However,no reports of the success rates for the effectiveness of such re–treatment as a distinct study outcome were found to be available.

Conclusions:

Surgical excision of keloid tumours followed by superficial radiotherapy given within 24 hours in a single dose of 10Gy has proven to be highly effective with minimal side effects and a low 5−year recurrence rate of 14.8%.

In the event of a recurrence, the radiotherapy treatment can be safely repeated in smaller (4Gy) fractions at three monthly intervals, up to a maximum of 16Gy over a year if necessary.When keloid tumours were re −treated, an audit of the outcome of this treatment regime found no recurrences at 5 years though,in a minority of patients, there was some skin thickening.

While the patient numbers in this audit are small and its statistics have low power, they demonstrate that successful retreatment of keloids tumours with radiotherapy alone is possible, with minimalside effects.

It can therefore be proposed that,when considering re−treatment of keloid recurrences by radiotherapy, other centres consider following this treatment regime, then audit outcome data to facilitate comparison and collation of results. A similar approach could also be employed more generally to permit a comparison of outcomes of treatment when other treatment methods, e.g. steroid tape, cryotherapy, laser, etc., are used.

References:

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