RT Technique and Doses for CTCL (Cutaneous T-Cell *Lymphoid Proliferations* and *Lymphomas*, WHO 5th ed.)

Richard T. Hoppe, MD
Stanford University

4th ILROG Educational Conference
London UK
10 September 2023

- No disclosures

What are the Primary Cutaneous T-Cell Lymphoid Proliferations and Lymphomas? (WHO 5th edition)

Mycosis fungoides

Sezary syndrome

Primary cutaneous CD30-positive T-cell *lymphoproliferative disorder*

- **Primary cutaneous anaplastic large cell lymphoma**
- **Lymphomatoid papulosis**

→ Most common

Primary cutaneous acral CD8-positive *lymphoproliferative disorder*

Primary cutaneous CD4-positive small or medium T-cell *lymphoproliferative disorder*

→ Indolent

Subcutaneous panniculitis-like T-cell lymphoma

Primary cutaneous gamma/delta T-cell lymphoma

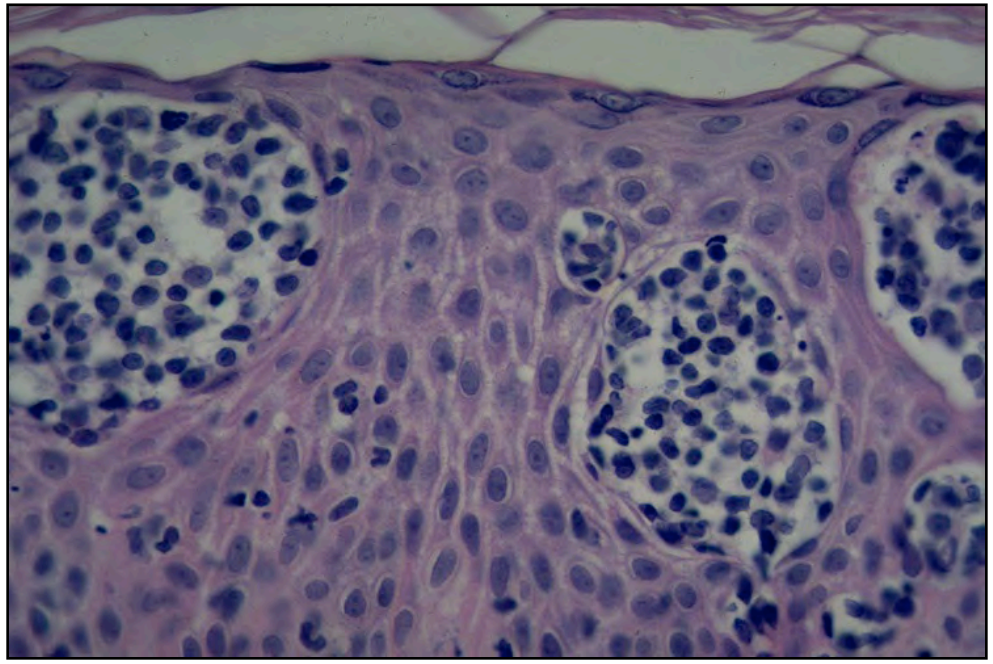
Primary cutaneous CD8-positive aggressive epidermotropic cytotoxic T-cell lymphoma

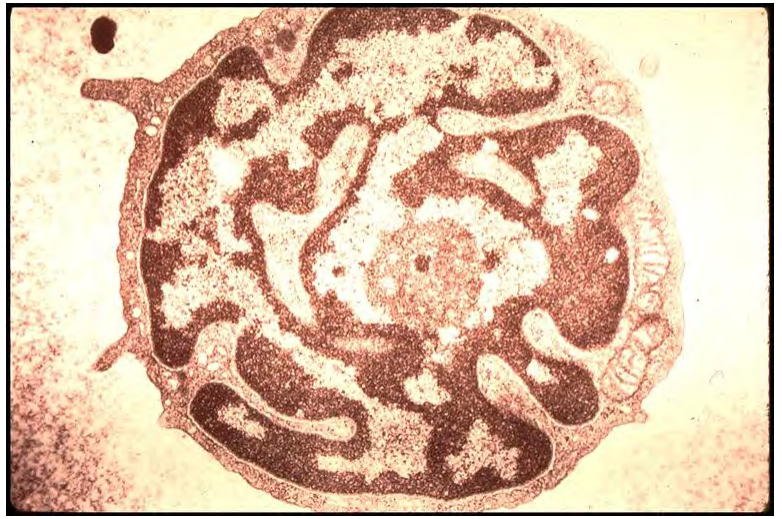
Primary cutaneous NK/T-cell lymphoma

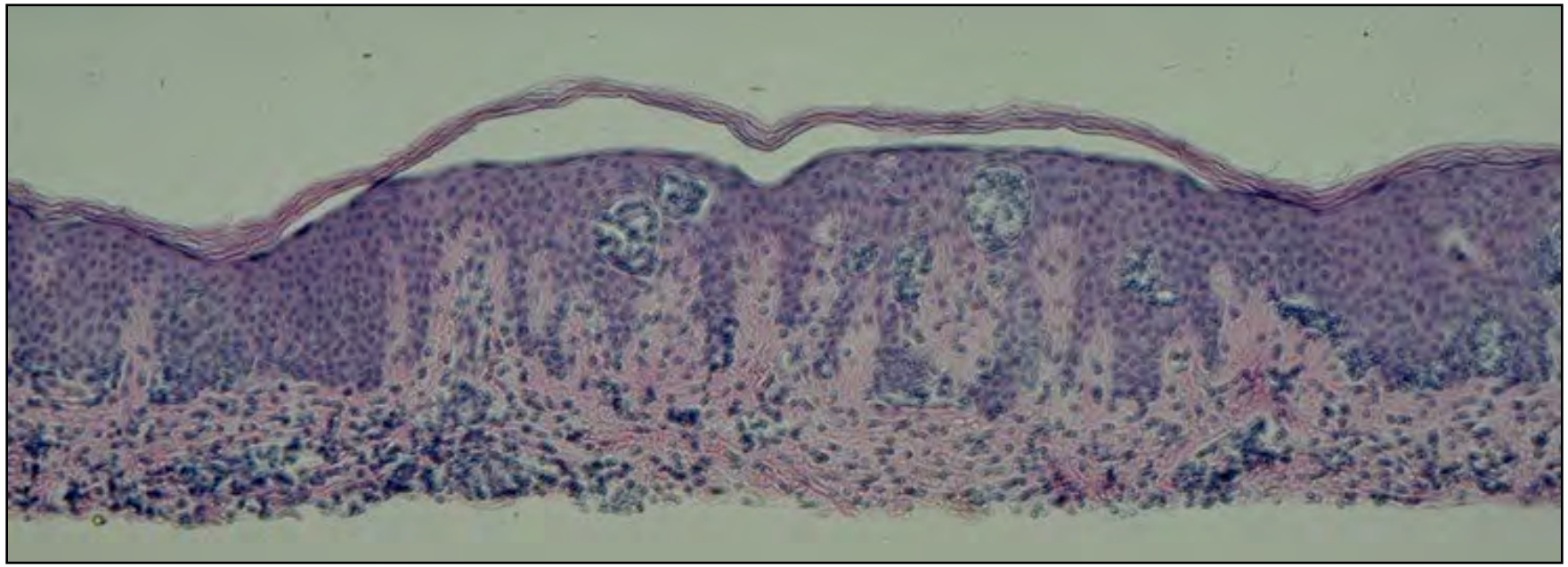
→ Aggressive

Primary cutaneous T-cell lymphoma (NOS)

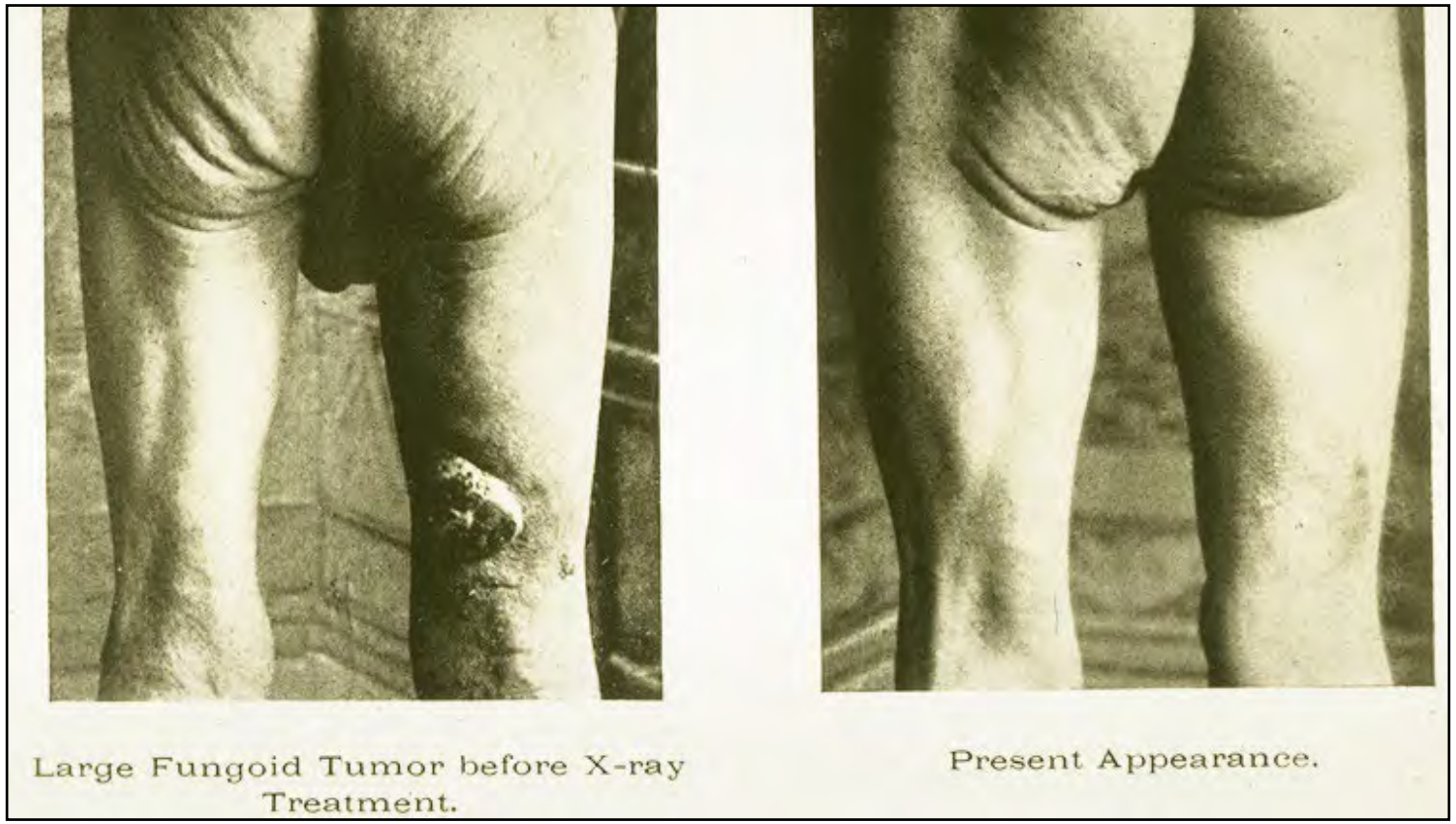
MF - Pathology



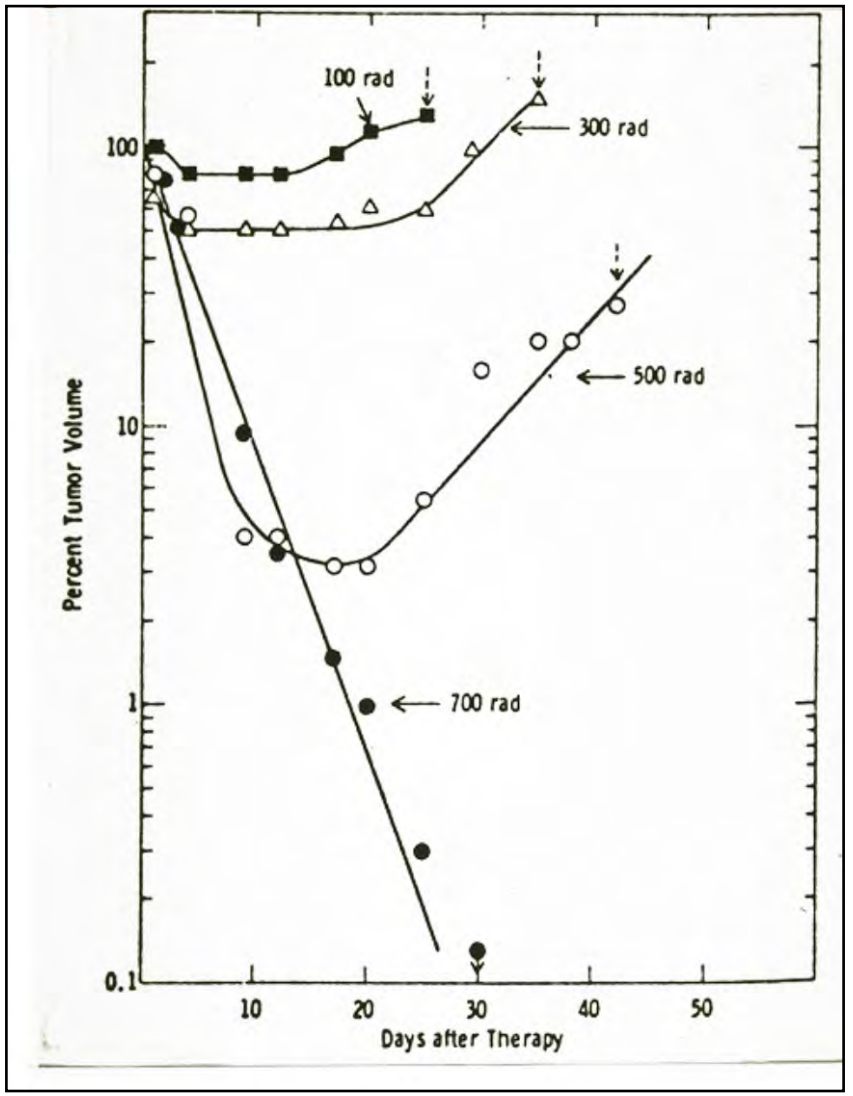




Historical Perspective



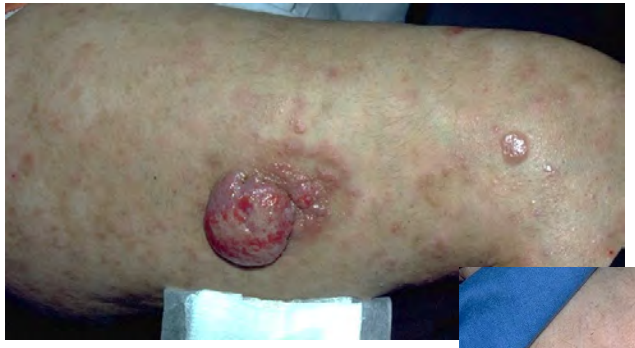
A.E. Carrier, *Journal of Cutaneous Diseases,* 1904;22:73-77

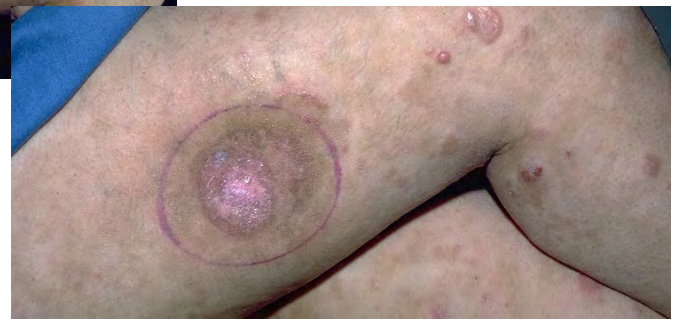


Kim JH et al., *Radiology* 1976;119:439-

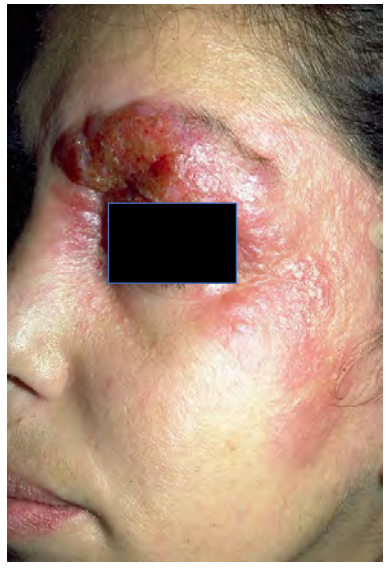
Local Radiation for MF

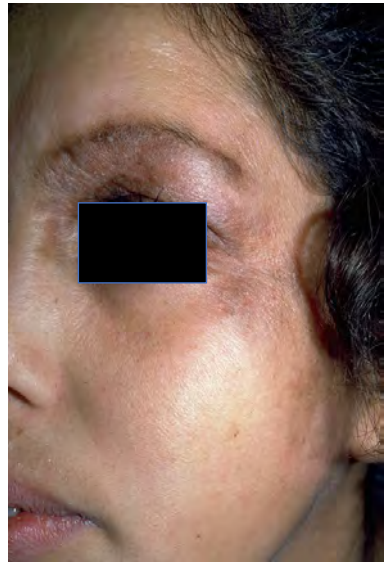
Author	Dose	N (pts)	N (lesions)	CR	Relapse	F-U (med)
Neelis KJ et al, 2009	8 Gy (2 fx)	24	65	92%	5/60 (8%)	5.3 mo
Thomas TO et al, 2013	8 Gy in 93%	58	270	94%	11/255 (4%)	N.S.
Wang P et al, 2023	8 Gy x 1	46	242	85%	None if CR	24.6 mo
Patel AM et al, 2023	8 Gy (2-4 fx)		106	87% ORR	FFTF 91.4%	16.3 mo





Low energy x-rays or electrons
6-9 MeV e- with bolus
1.0-1.5 cm margins





Total Skin Electron Beam Therapy (TSEBT)

Amer. J. of Roentgenology
Vol. 69, No. 4, 1963

HIGH ENERGY ELECTRONS FOR THE TREATMENT OF EXTENSIVE SUPERFICIAL MALIGNANT LESIONS*

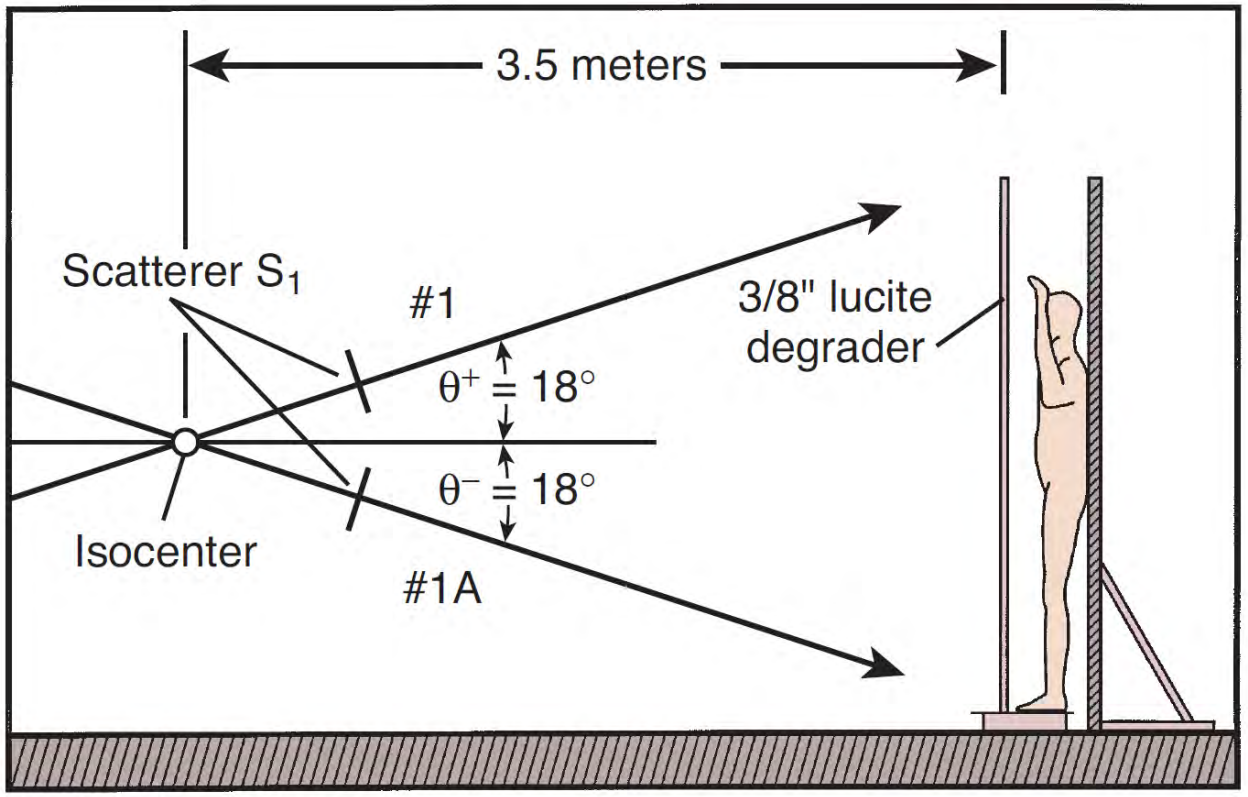
By JOHN G. TRUMP, Sc.D., KENNETH A. WRIGHT, W. W. EVANS *and* JOHN H. ANSON
Massachusetts Institute of Technology
CAMBRIDGE, MASSACHUSETTS
and
HUGH F. HARE, M.D., J. L. FROMER, M.D., GUY JACQUE, M.D., *and* KENNETH W. HORNE, M.D.
Lahey Clinic
BOSTON, MASSACHUSETTS

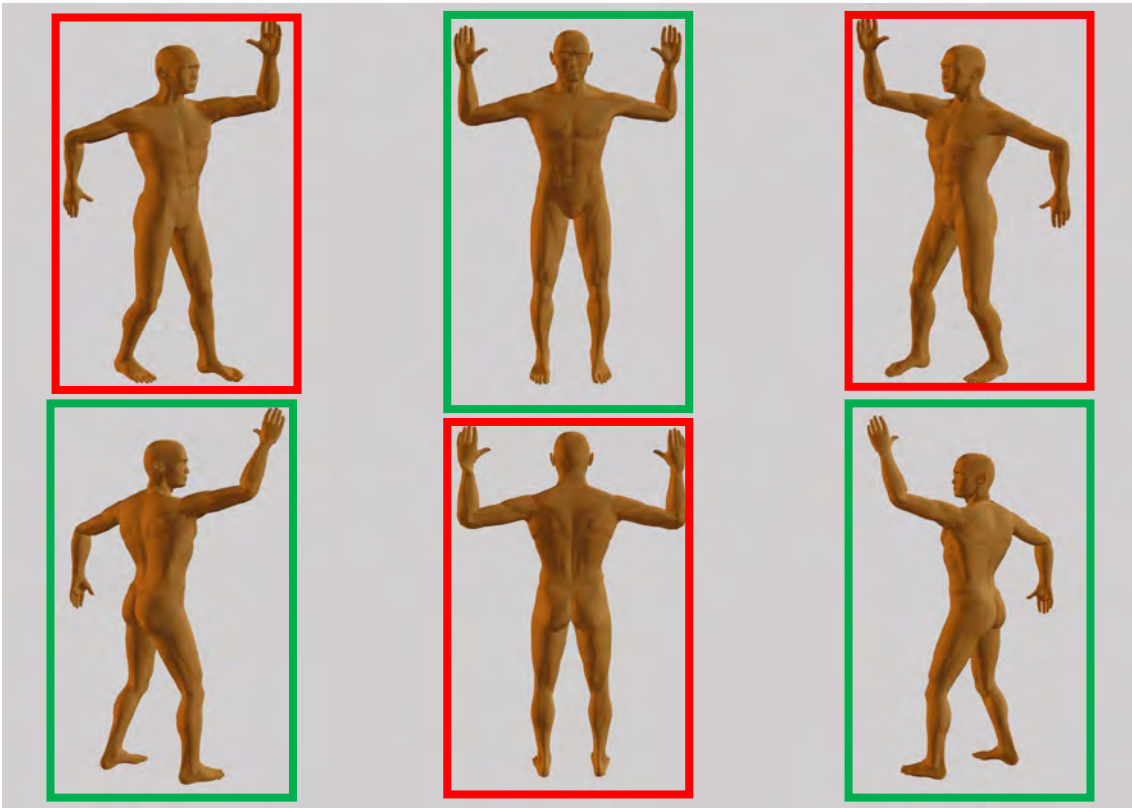
[Reprinted from RADIOLOGY, Vol. 74, No. 4, Pages 633–644, April, 1960.]

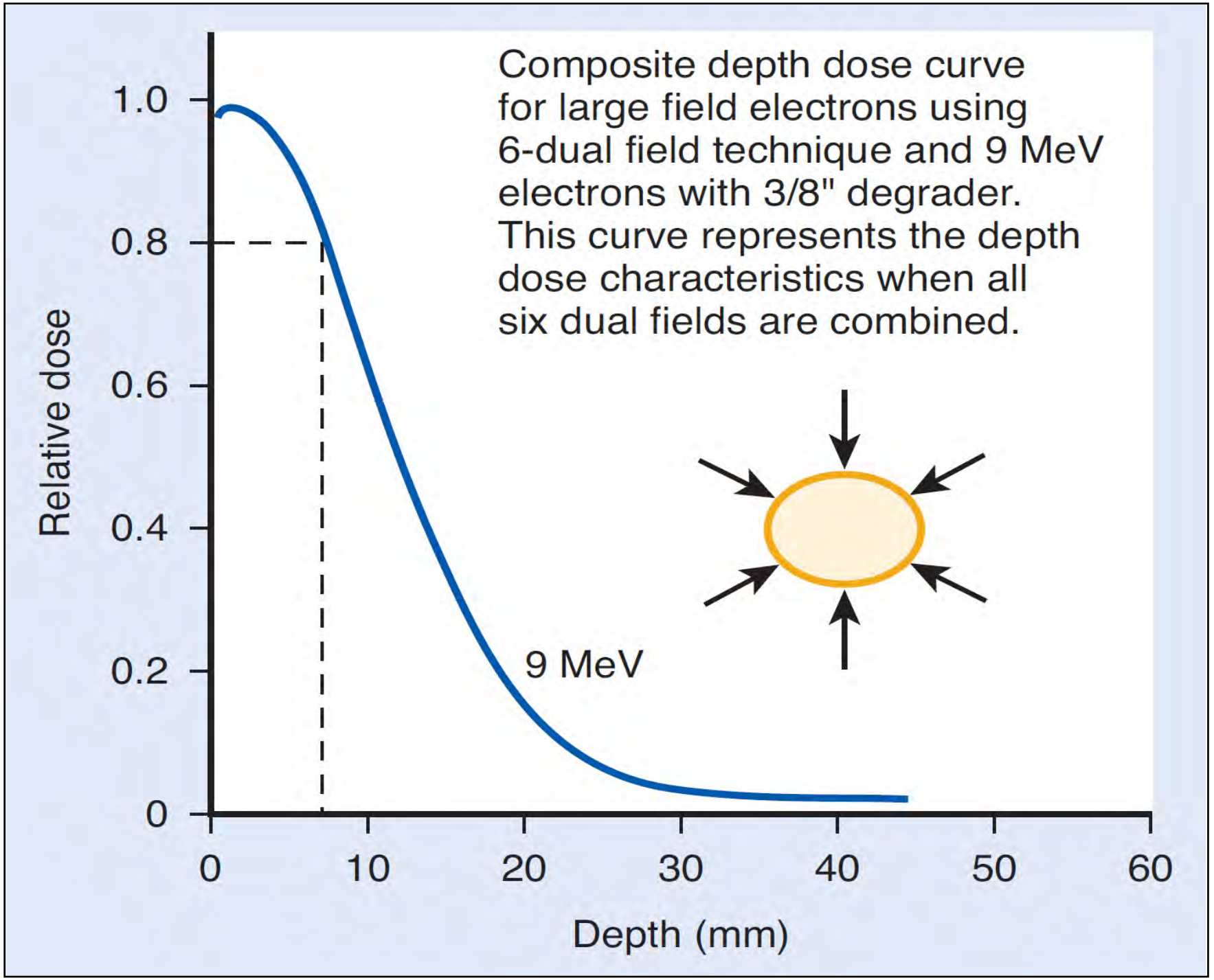
A Technique for Large-Field, Superficial Electron Therapy[1]

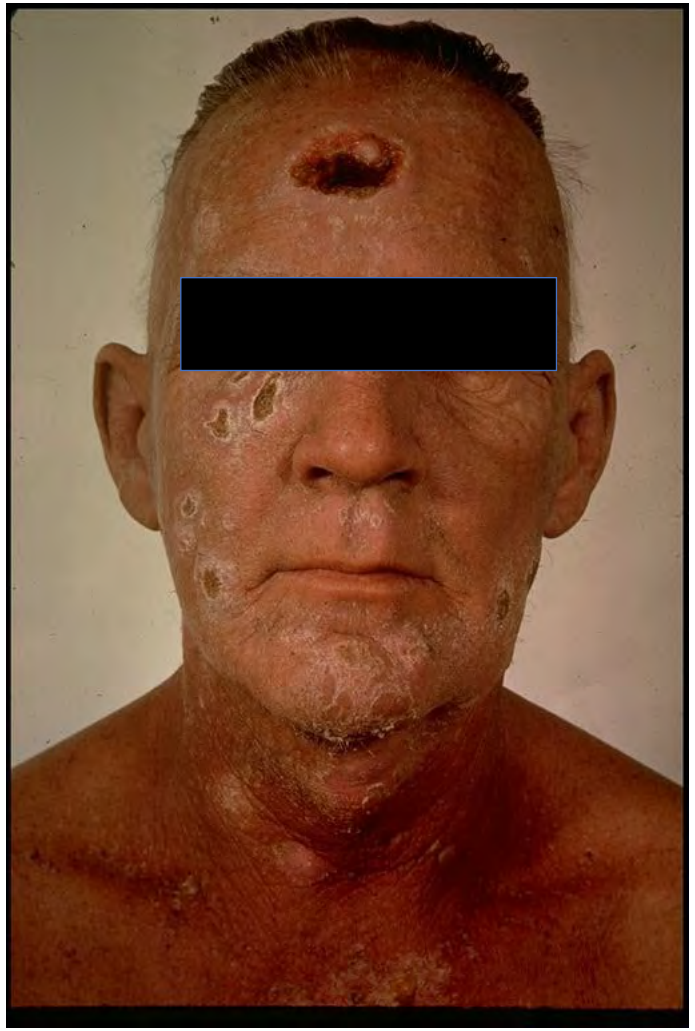
C. J. KARZMARK, Ph.D., R. LOEVINGER, Ph.D., R. E. STEELE, Ph.D., and M. WEISSBLUTH, Ph.D.

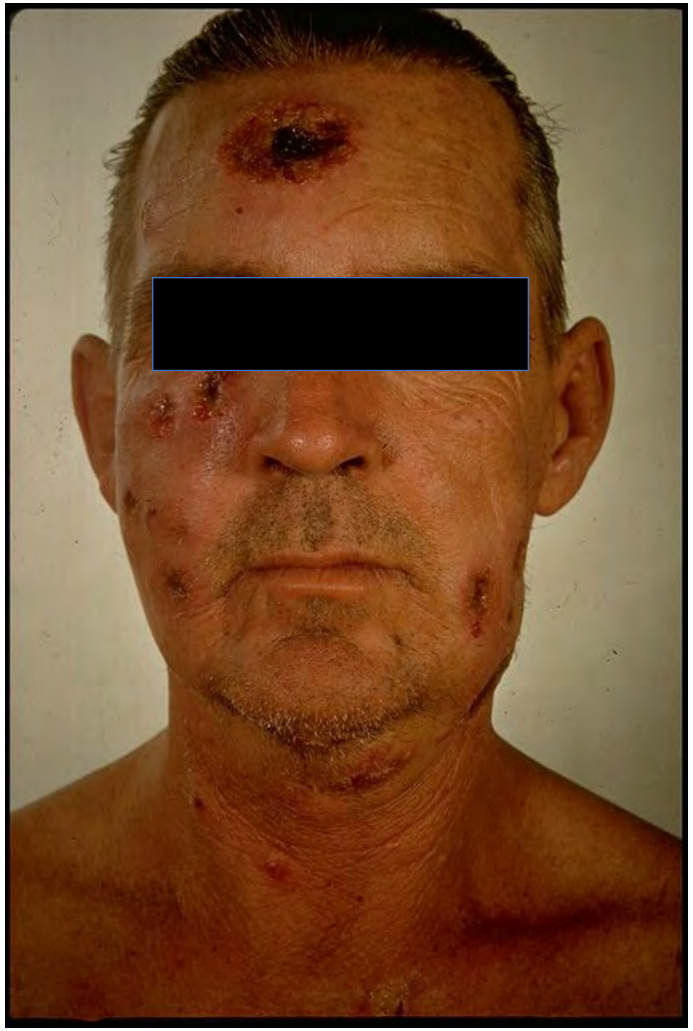
Stanford Six Dual Field Technique

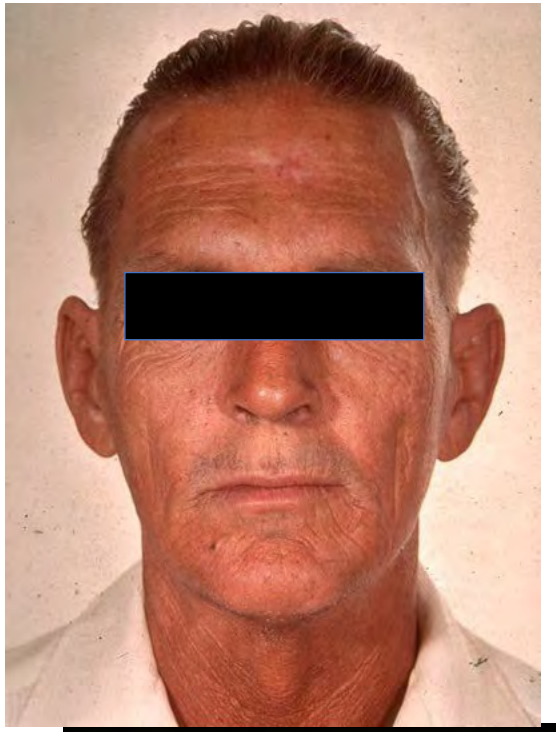


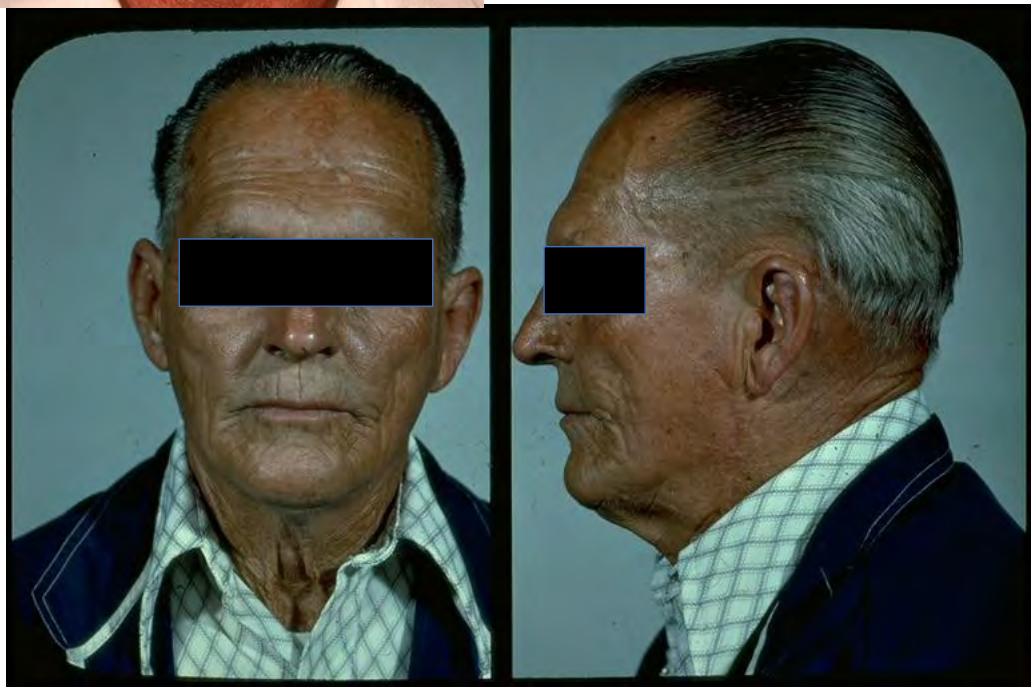


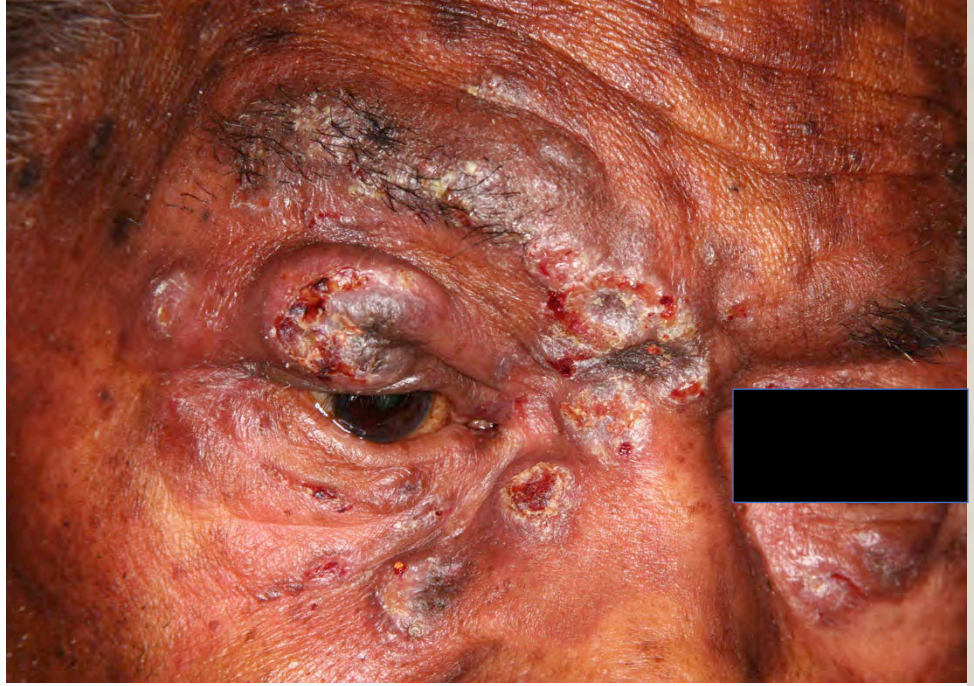

Composite depth dose curve for large field electrons using 6-dual field technique and 9 MeV electrons with 3/8" degrader. This curve represents the depth dose characteristics when all six dual fields are combined.
Relative dose
1.0
0.8
0.6
0.4
0.2
0
9 MeV
0
10
20
30
40
50
60
Depth (mm)

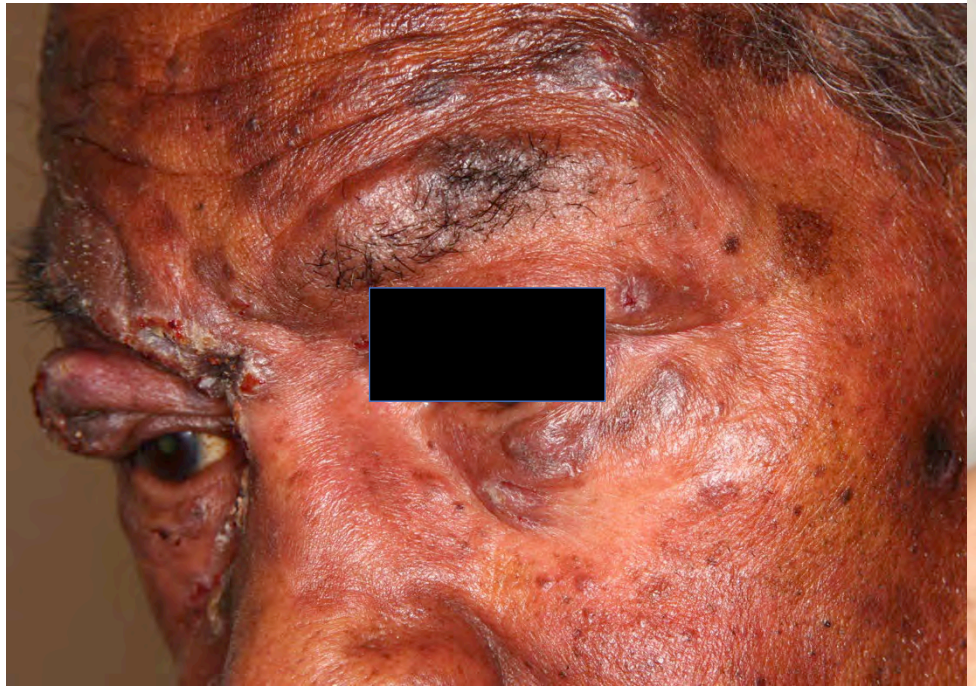


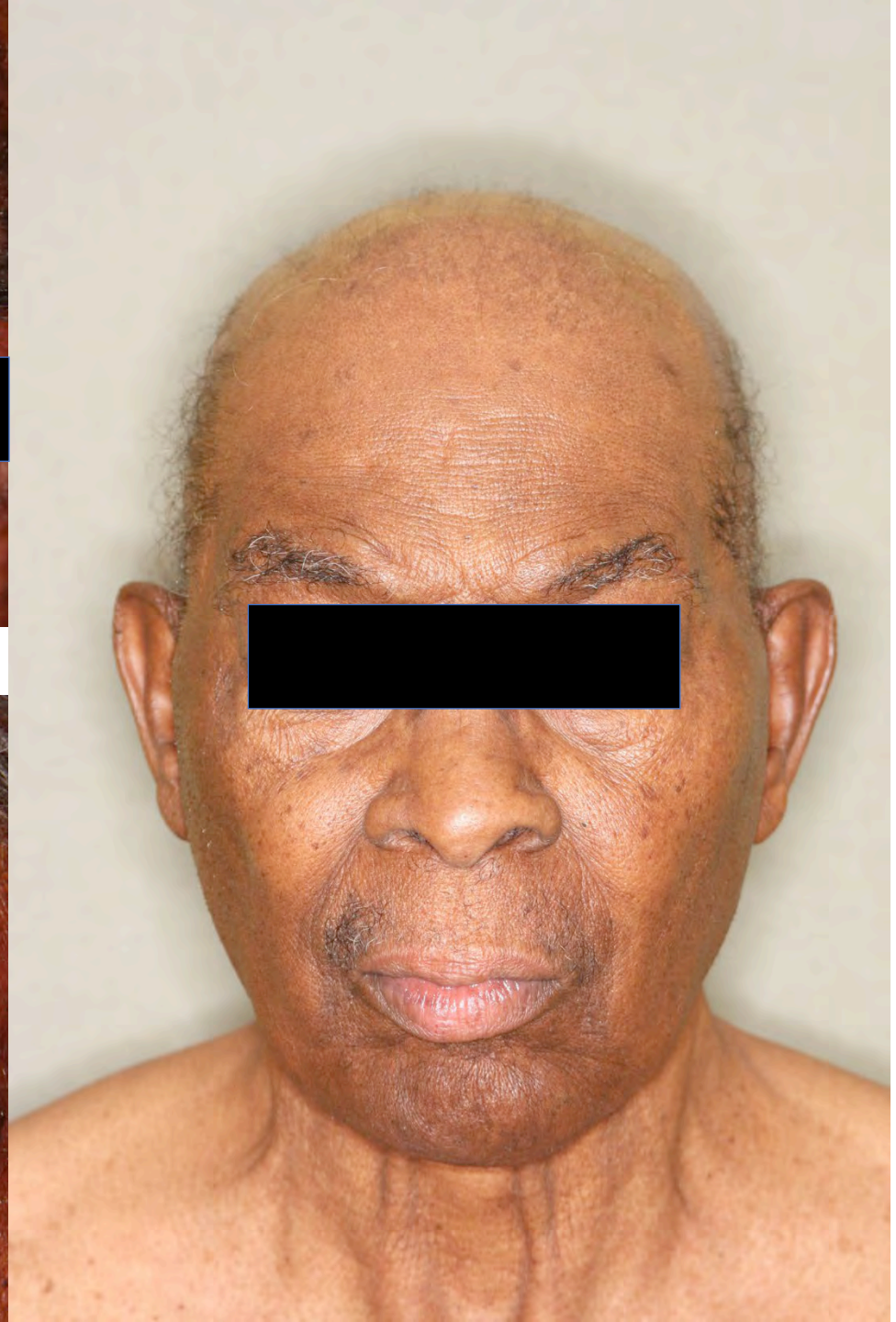




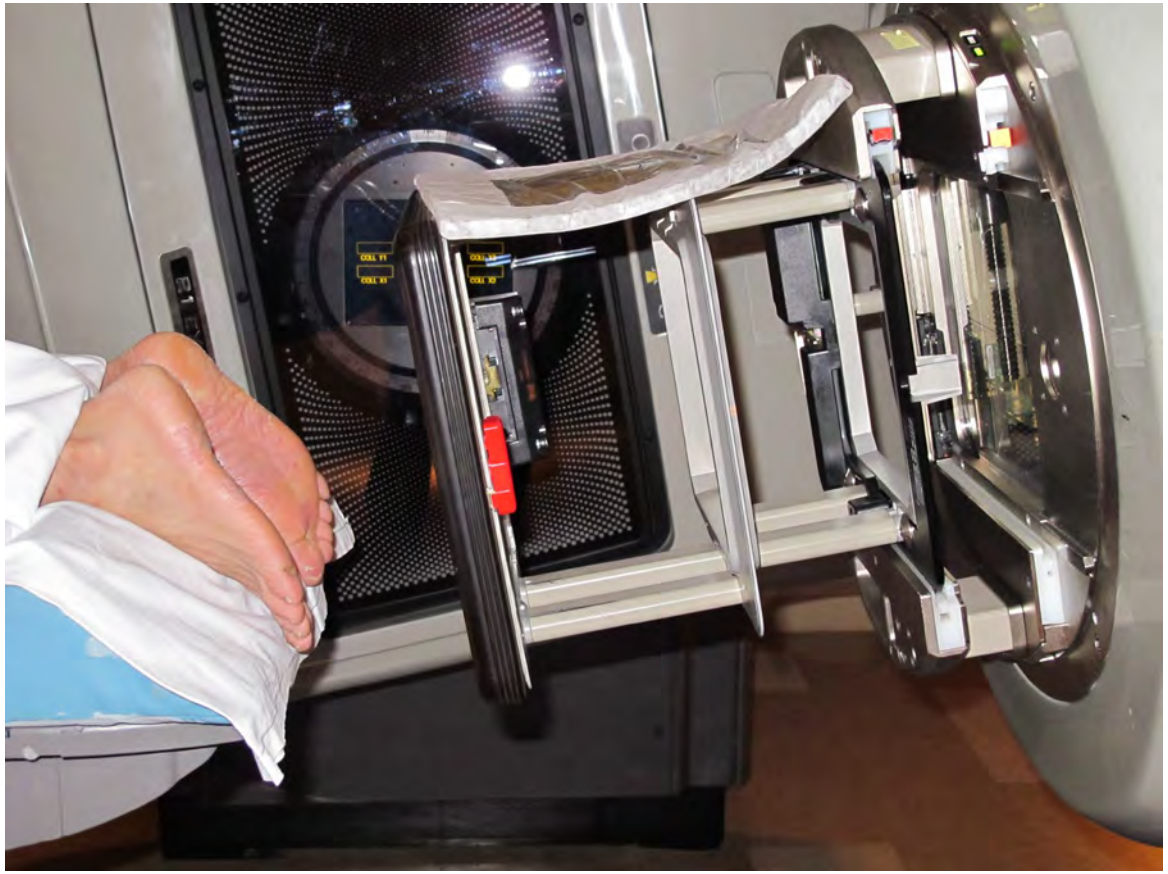




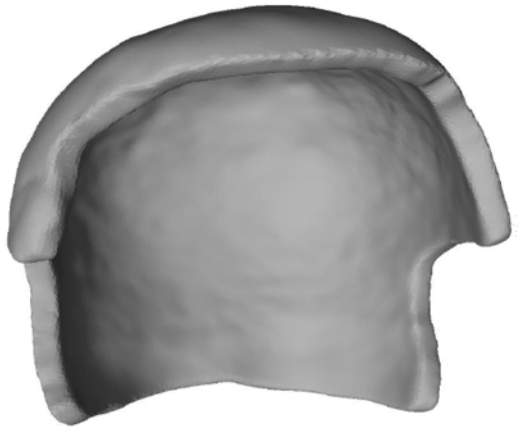




TSEBT – Supplements and Selective Shielding

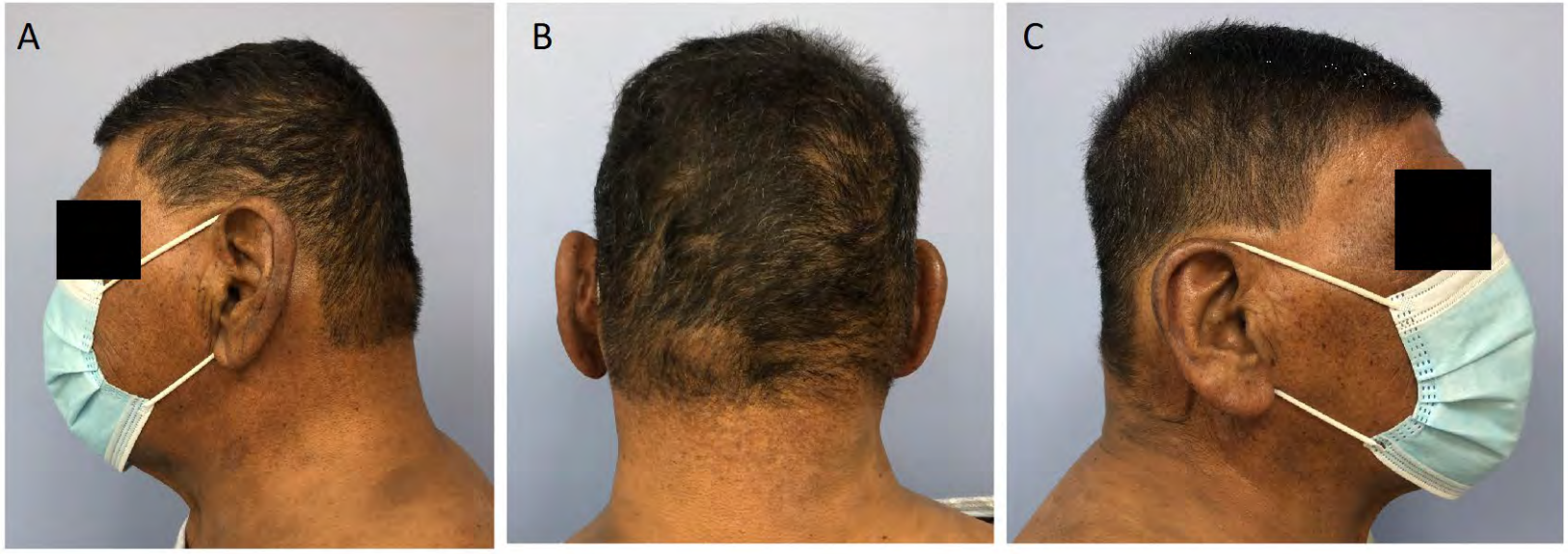


TSEBT – Scalp Shielding



3-D printed scalp shield

2 months after completion of TSEBT

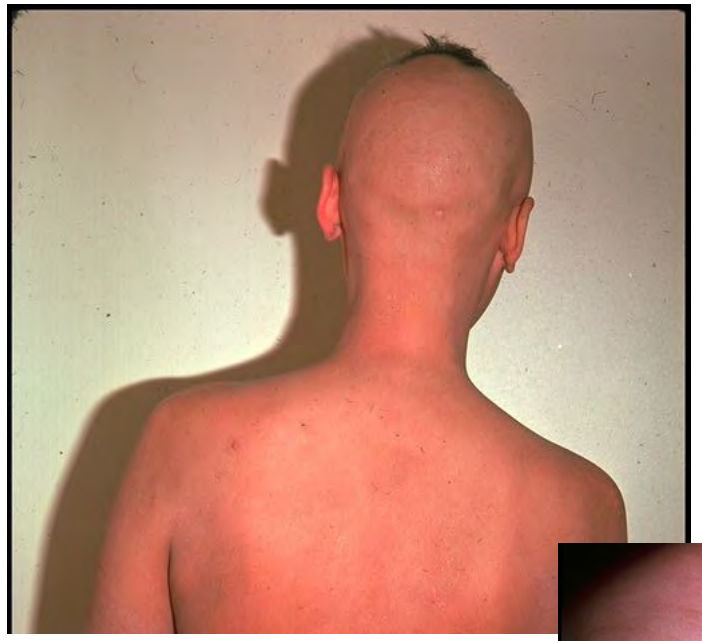


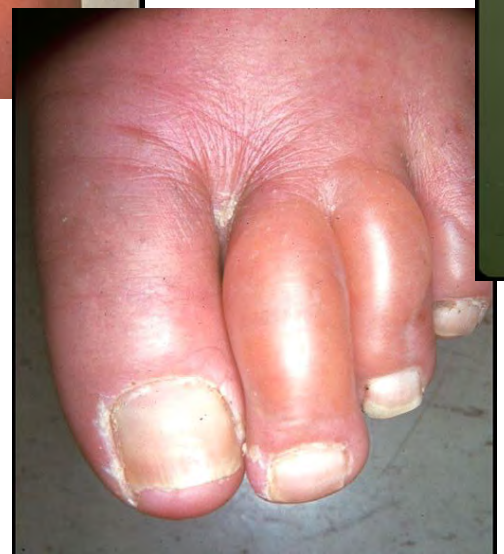
El-Rahimy E et al., *Tech Innov Rad Onc* 2020;18:12-15

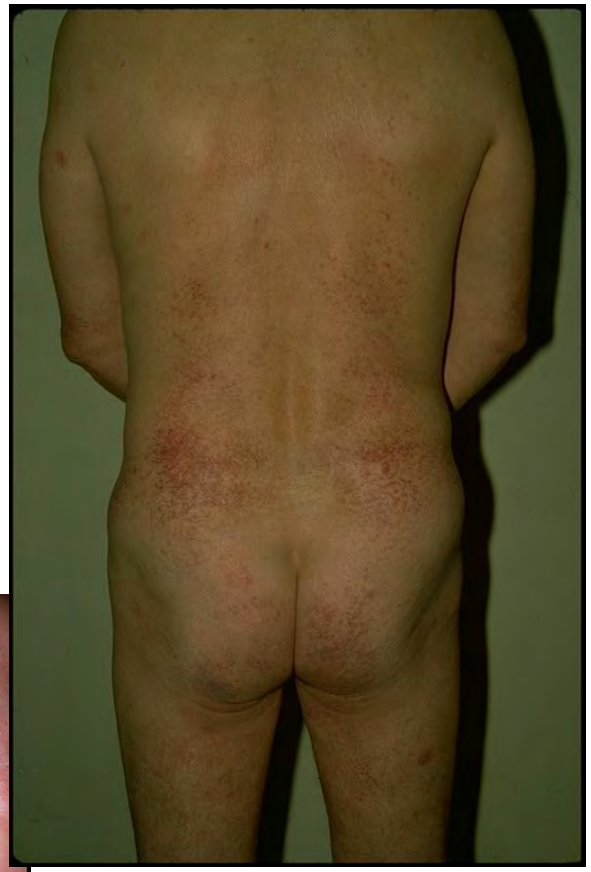
TSEBT – Potential Dose-Related Complications

- Xerosis
- Desquamation
- Anhydrosis
- Alopecia
- Blisters
- Telangiectasias
- Onycholysis

Most of these data were from 36 Gy





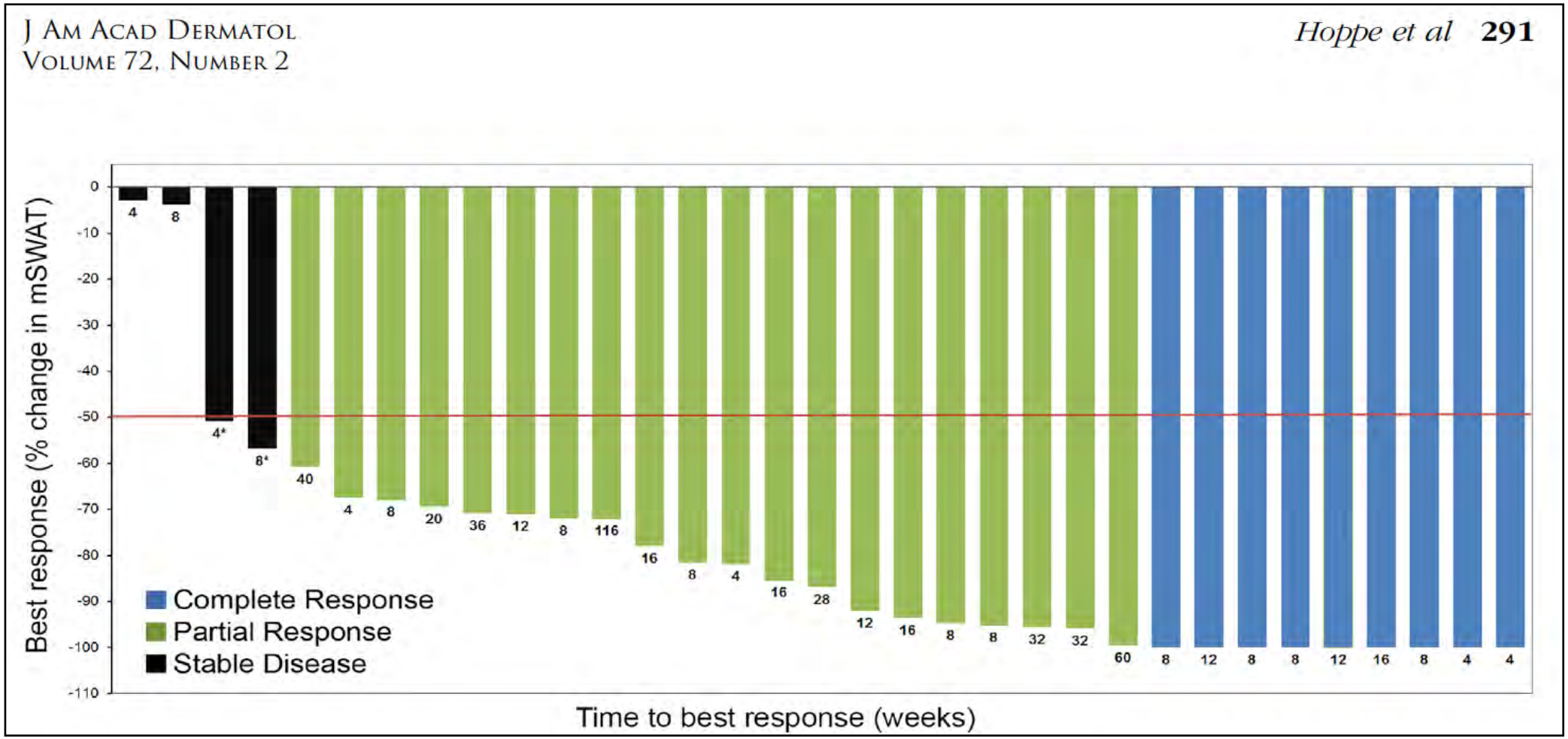


TSEBT – Response Rates, Stage IB/IIB

Dose	CR	ORR
< 10 Gy	20%	87%
10-<20 Gy	36%	97%
20-<30 Gy	35%	100%
≥30 GY	63%	100%

From Hoppe RT et al., *Cancer Treat Rep* 1976;63:625-632

TSEBT – 12 Gy Prospective Trial

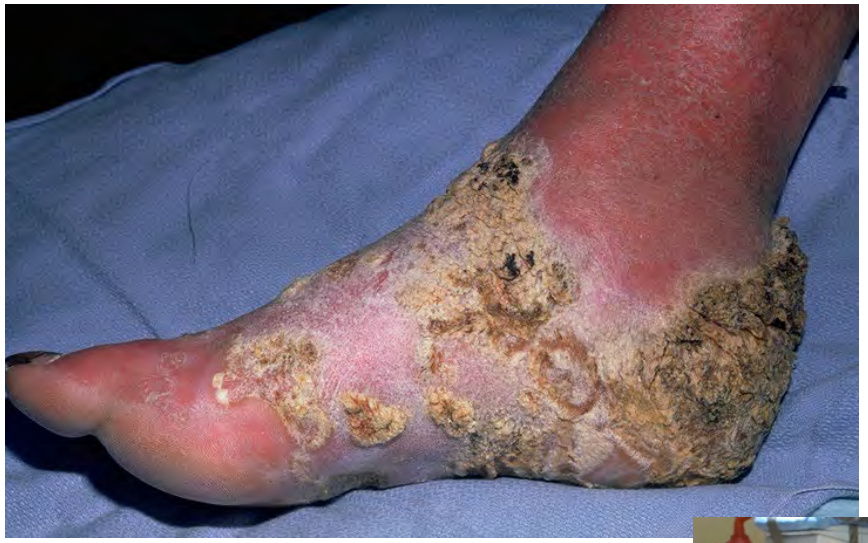


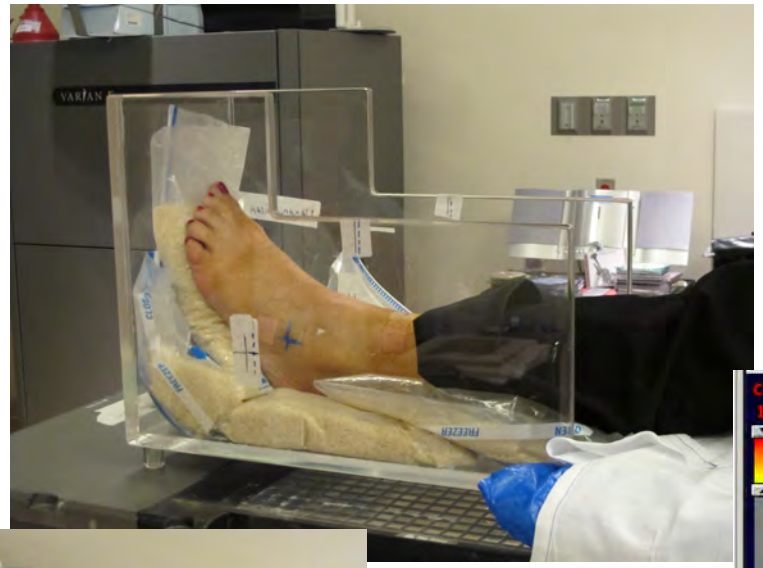
CR = 9/33 (27%); ORR = 31/33 (94%)

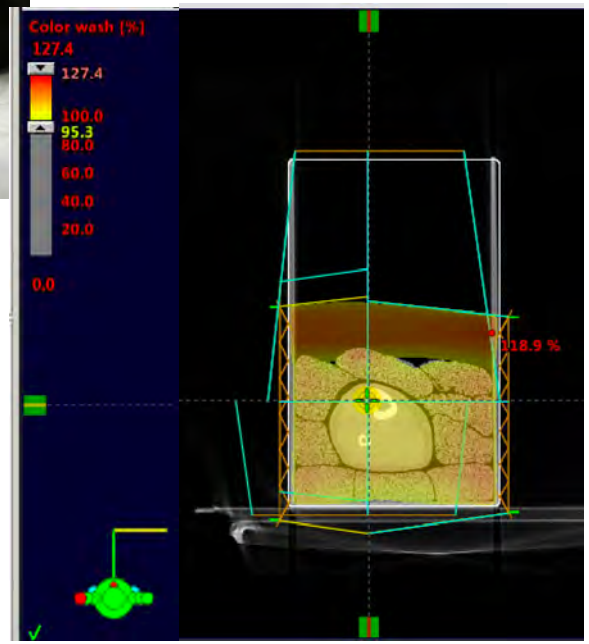
DOCB for responders = 42-134 wks. Median = 70.7

A new SoC!

RT for MF – Special Techniques

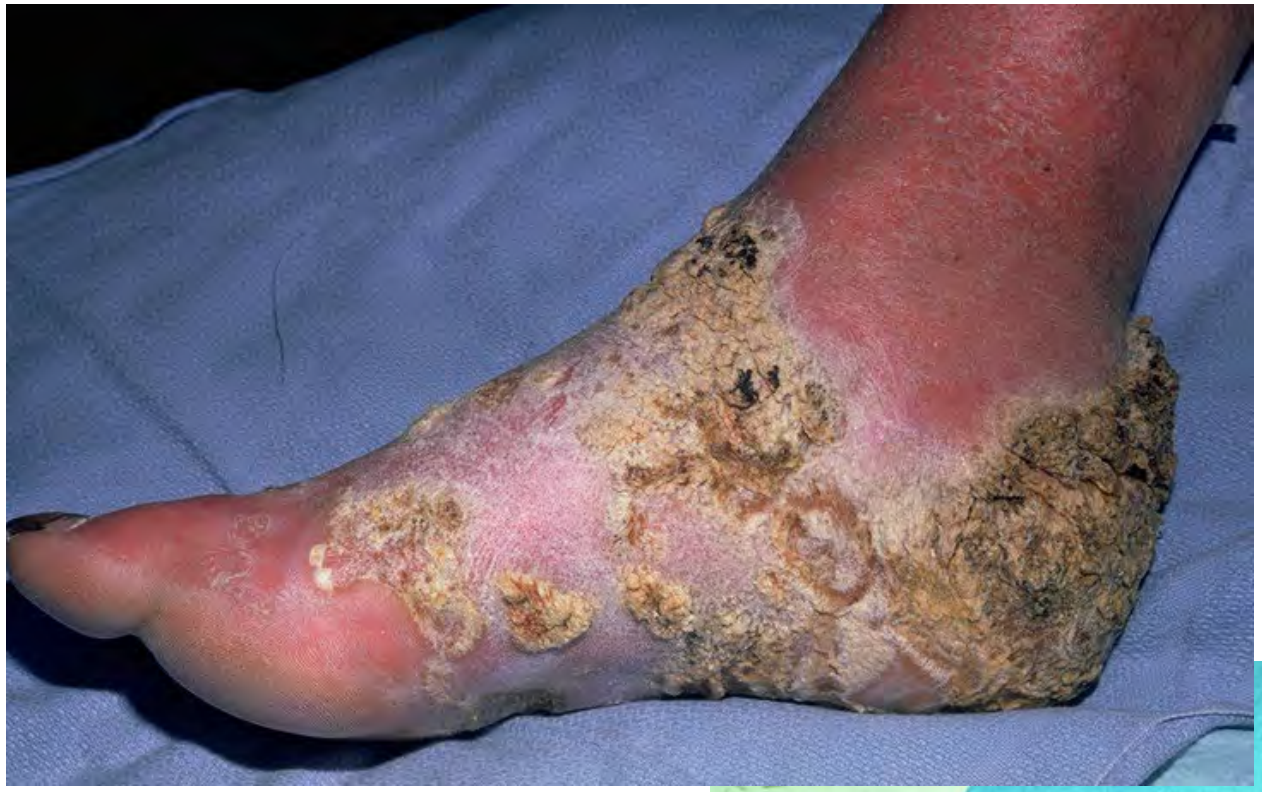


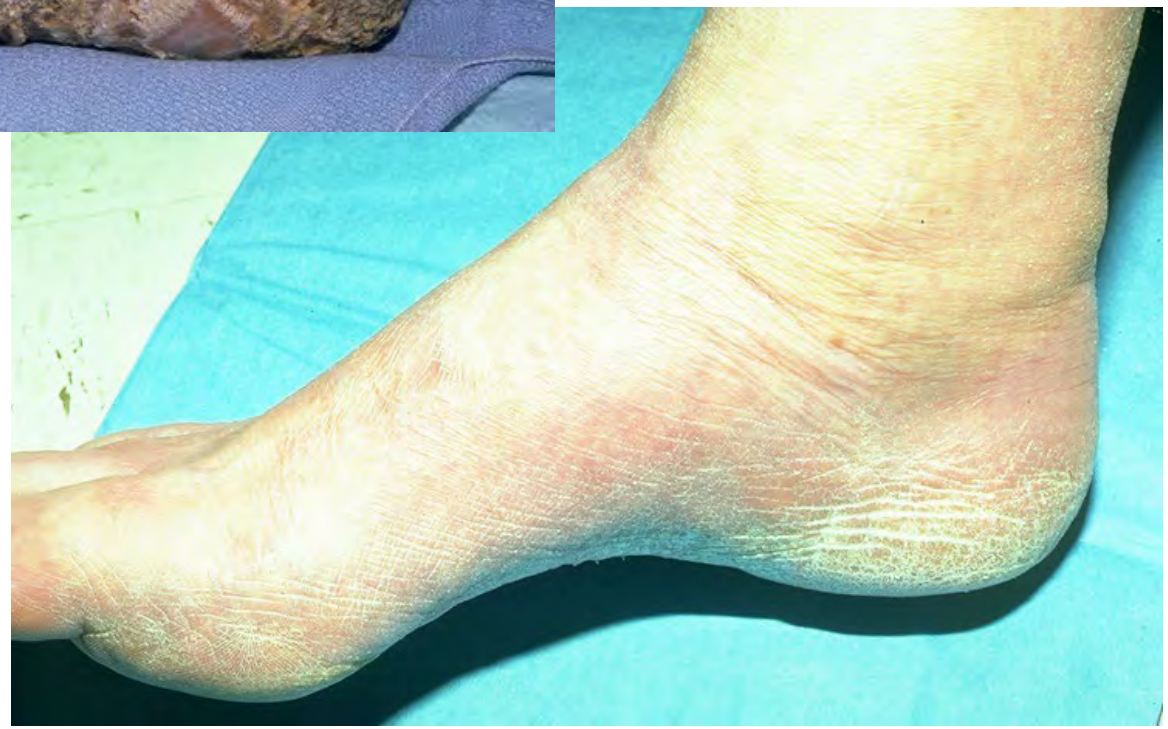




Woringer-Kolopp Disease
Pagetoid Reticulosis

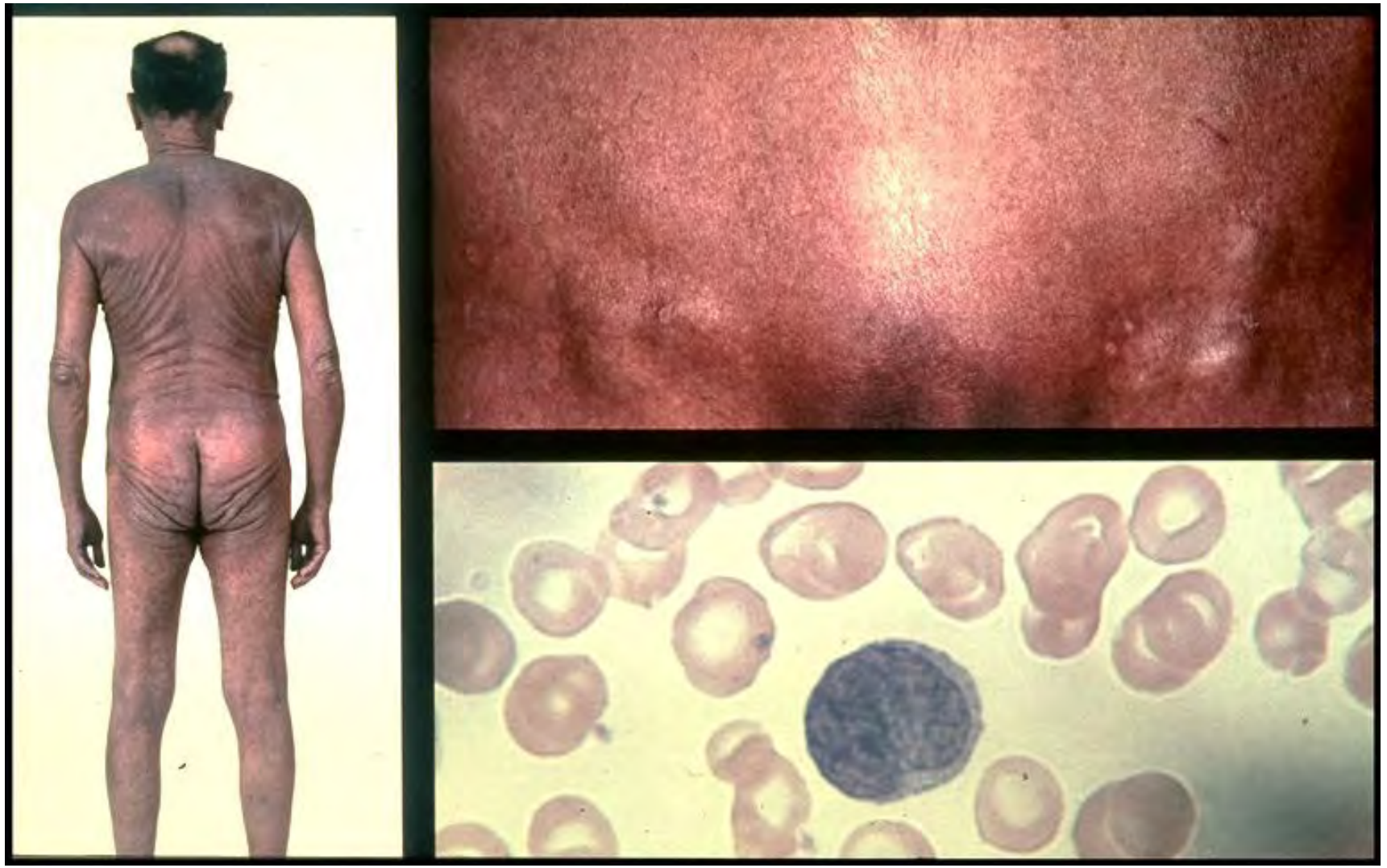
*





MF ISRT for Nodal Disease

Sezary Syndrome (SS)



MF/SS – Reduced Intensity Conditioning + Allotransplantation

24-36 Gy TSEBT

↓

8 Gy TLI (0.8 Gy x 10)

+

ATG during first week of TLI

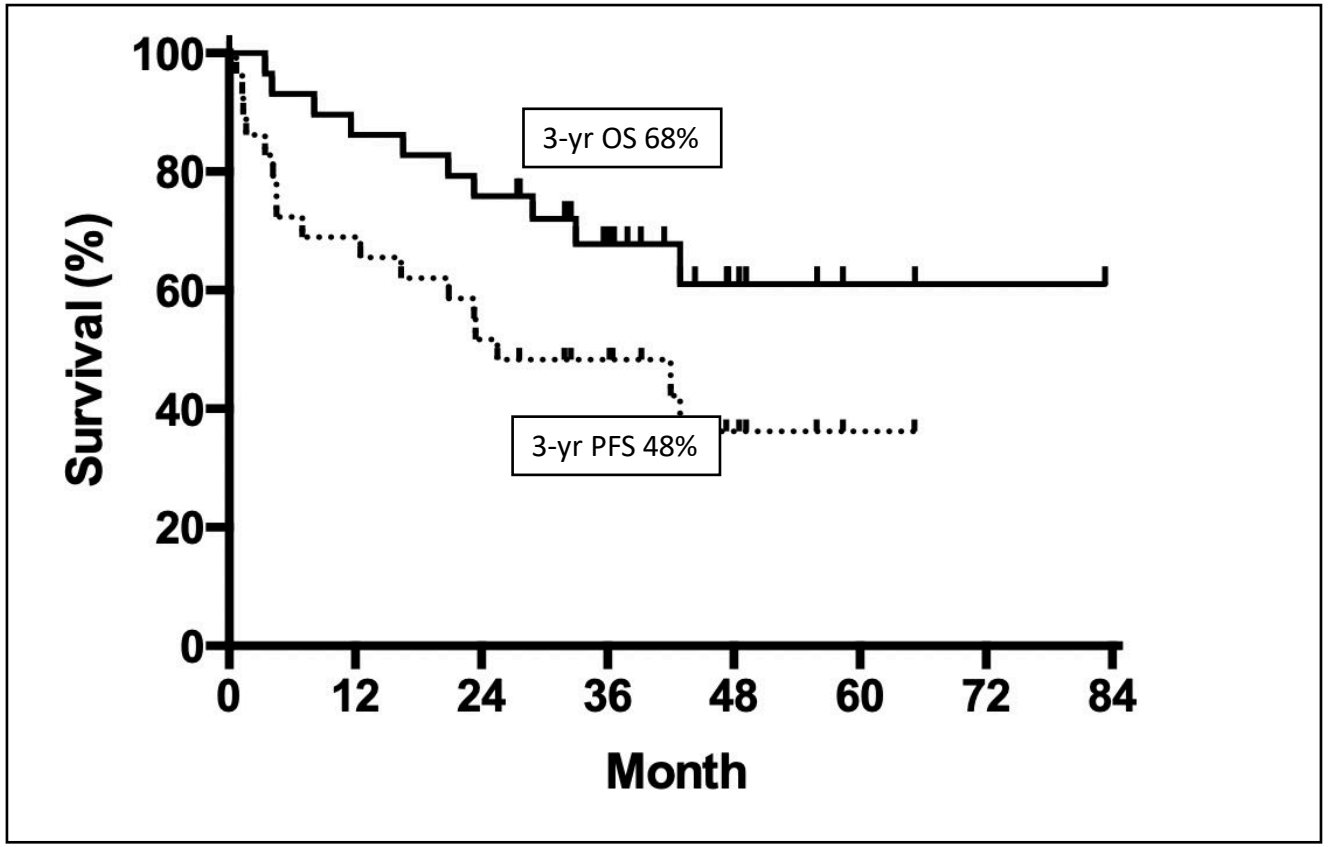
↓

Stem Cell Infusion

N=29

SS=18 (62%)

Median follow up = 3 years



Weng W-K et al., *BLOOD Advances* 2020

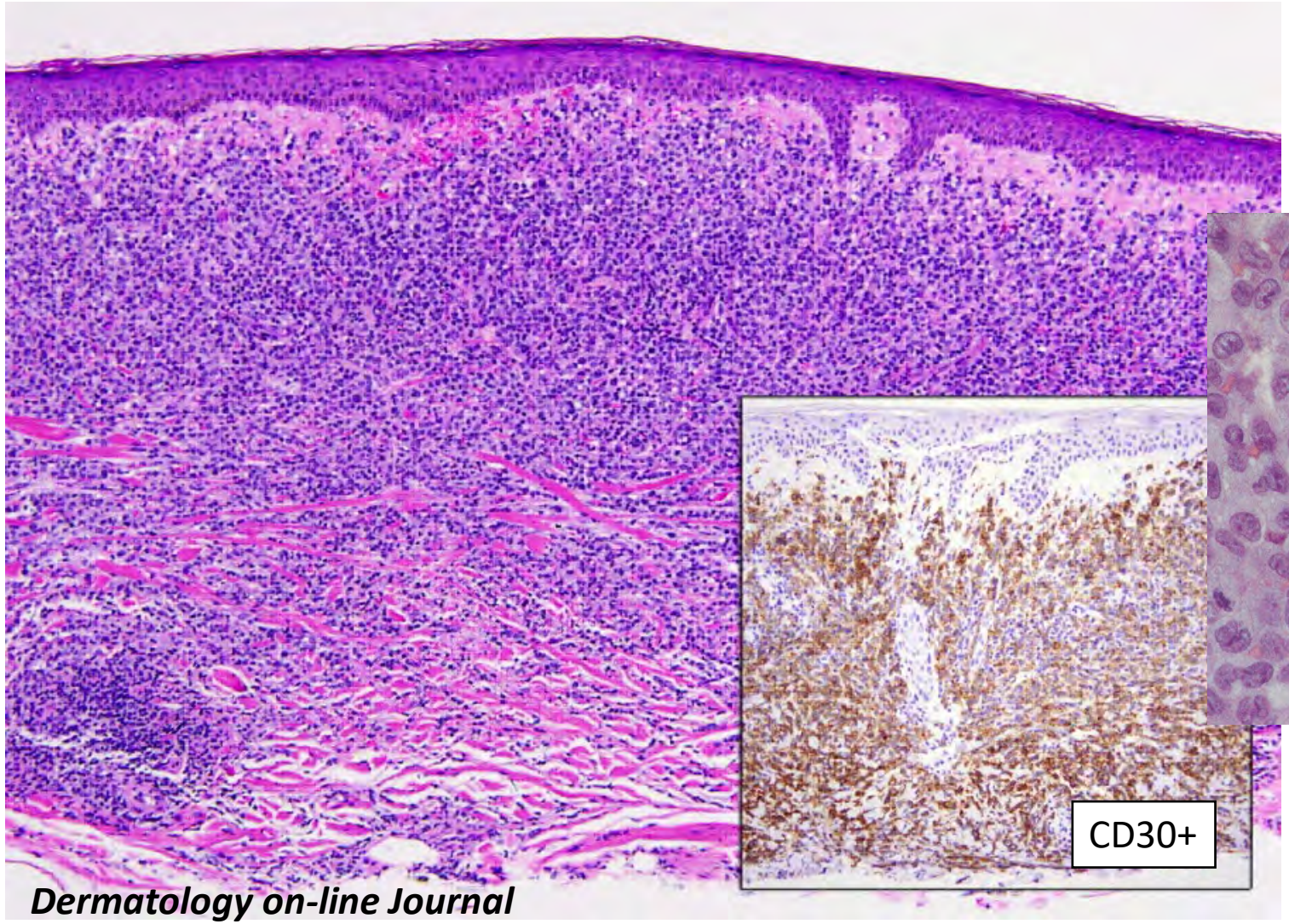
Primary Cutaneous CD30+ T-Cell Lymphoproliferative Disorders

- Primary cutaneous anaplastic large cell lymphoma (pcALCL)
- Lymphomatoid papulosis (LyP)

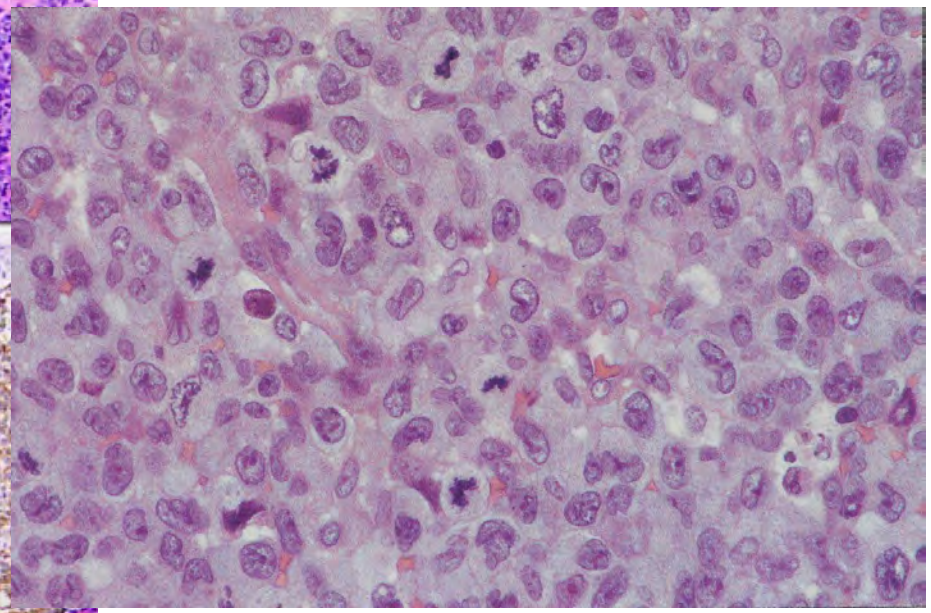
Cannot be differentiated histologically, defined by their clinical presentation and course

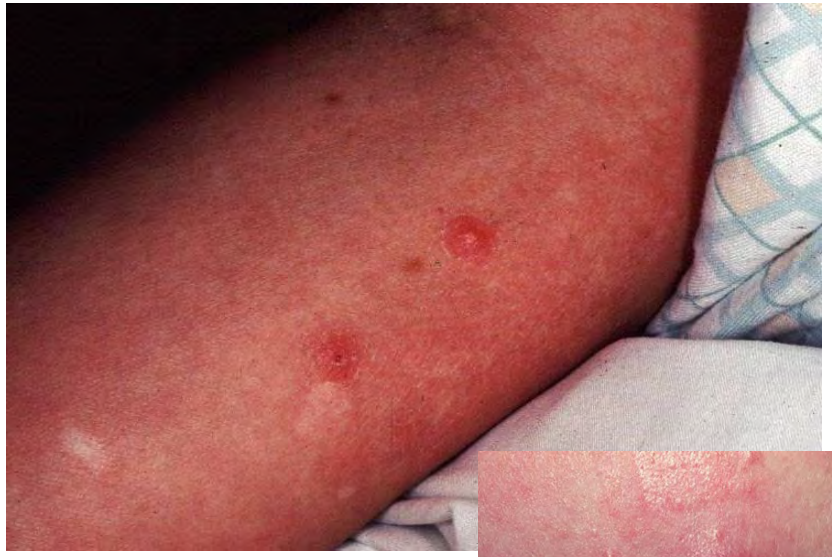
- **LyP** chronic (years to decades), recurrent, self-healing papulo-nodular skin lesions at different stages of development; lesions regress within 1-3 months, often leaving scars; associated with MF, ALCL, or Hodgkin lymphoma (in 4-25% of patients)
- **pcALCL** solitary or clustered (80%); often ulcerated; rapidly growing; may have spontaneous regression (partial). Lymph node involvement not uncommon.

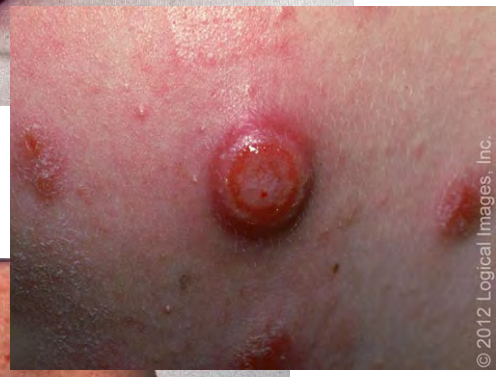
PC CD30+LPD - Histopathology

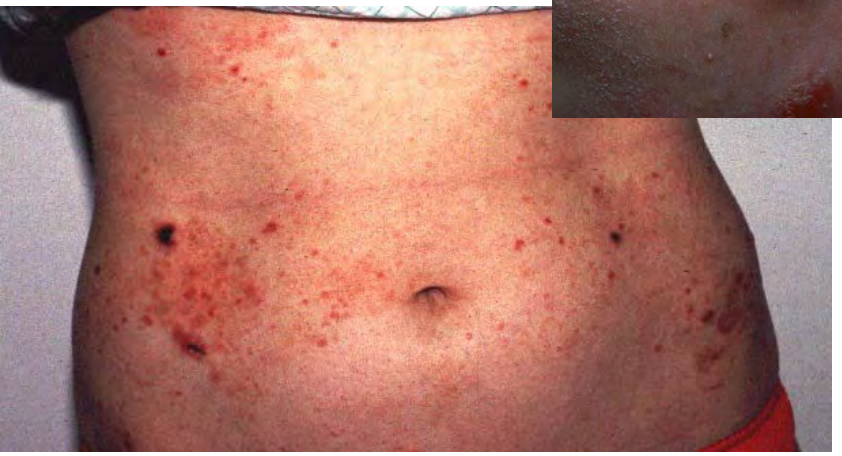


pcALCL or LyP?

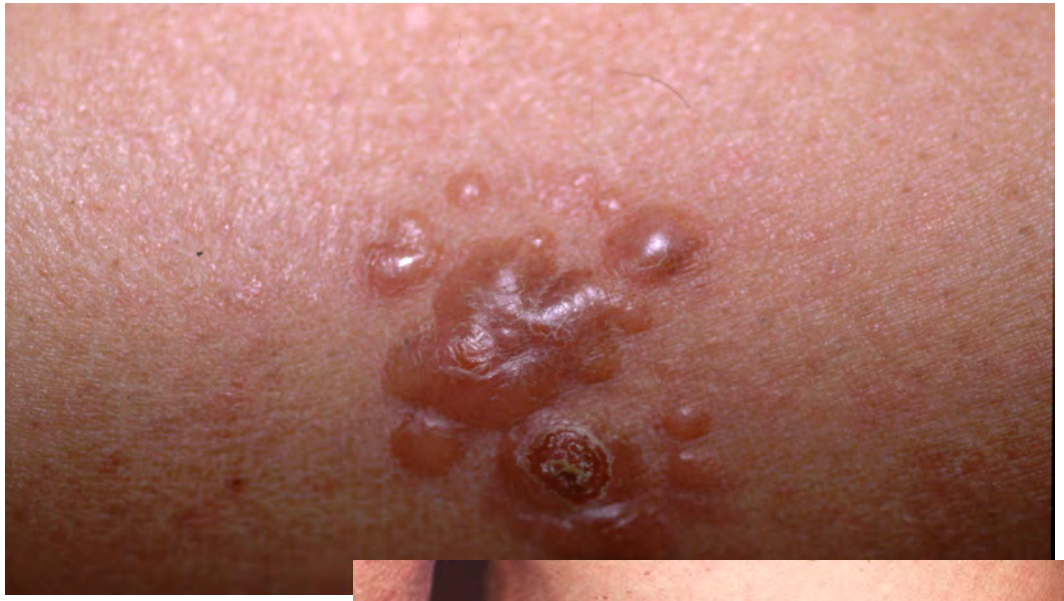


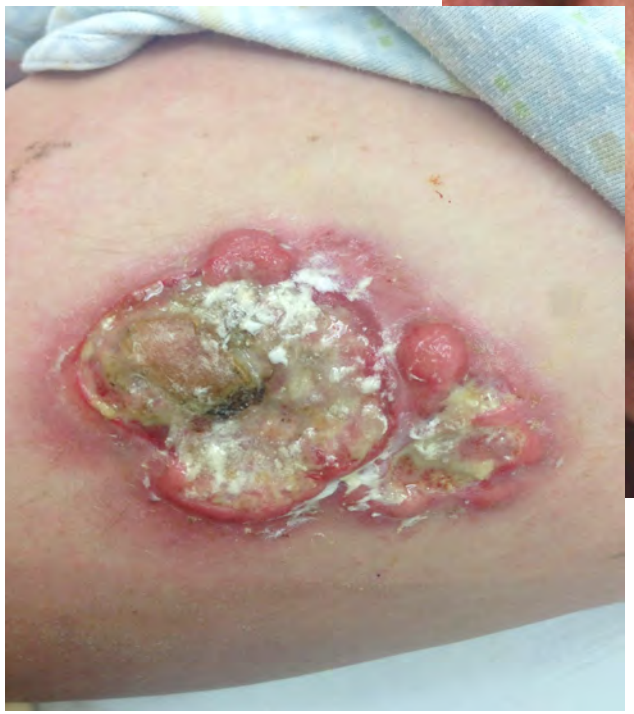


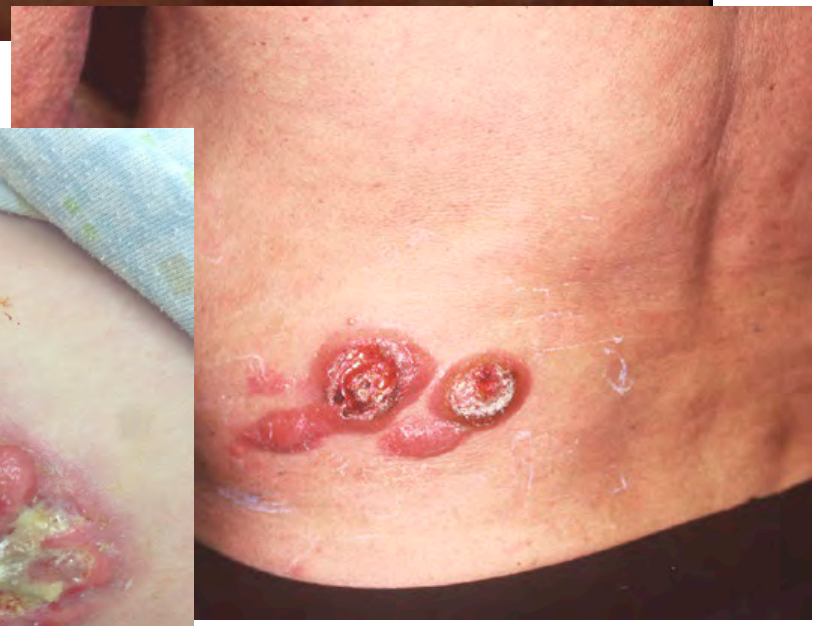




LyP







pcALCL

pcALCL - Radiation Dose vs. Response

Million L et al, *Int J Radiation Oncol Biol Phys* 2016

Dose Range	TOTAL Lesions	CR	CR Rate
<30 Gy	8	8	100%
30-39 Gy	36	35	97%
≥40 Gy	16	15	94%
TOTAL	60	58	97%

Smith GL et al, *Adv Rad Onc 2017*

Dose Range	TOTAL Lesions	CR	CR Rate
≤12 Gy	7	7	100%
13-<20 Gy	12		
20-29 Gy	9		
≥30 Gy	13		
TOTAL	41	36	87%

Local Control 97/99 = 98%

Recommended by ILROG (2015): 24-30 Gy

Specht L et al., *Int J Radiation Oncol Biol Phys* 2015;92:32-

The Less Common CTCLs

Mycosis fungoides

Sezary syndrome

Primary cutaneous CD30-positive T-cell *lymphoproliferative disorder*

- Primary cutaneous anaplastic large cell lymphoma
- Lymphomatoid papulosis

Primary cutaneous acral CD8-positive *lymphoproliferative disorder*

Primary cutaneous CD4-positive small or medium T-cell *lymphoproliferative disorder*

→ Indolent

Subcutaneous panniculitis-like T-cell lymphoma

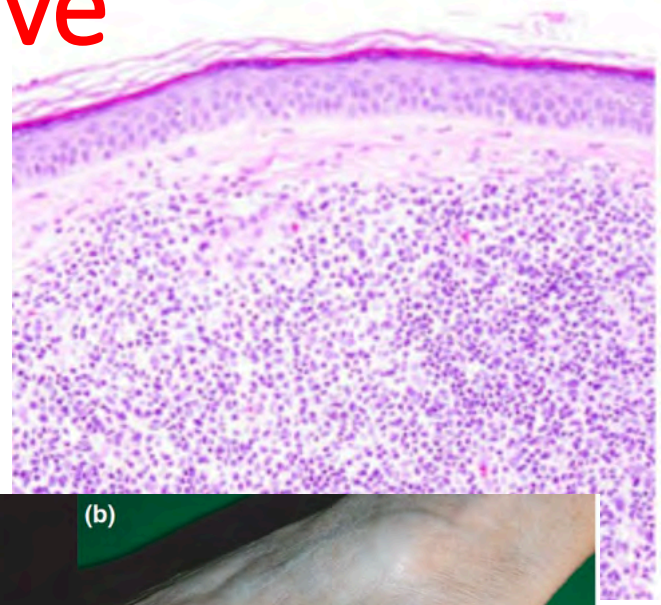
Primary cutaneous gamma/delta T-cell lymphoma

Primary cutaneous CD8-positive aggressive epidermotropic cytotoxic T-cell lymphoma

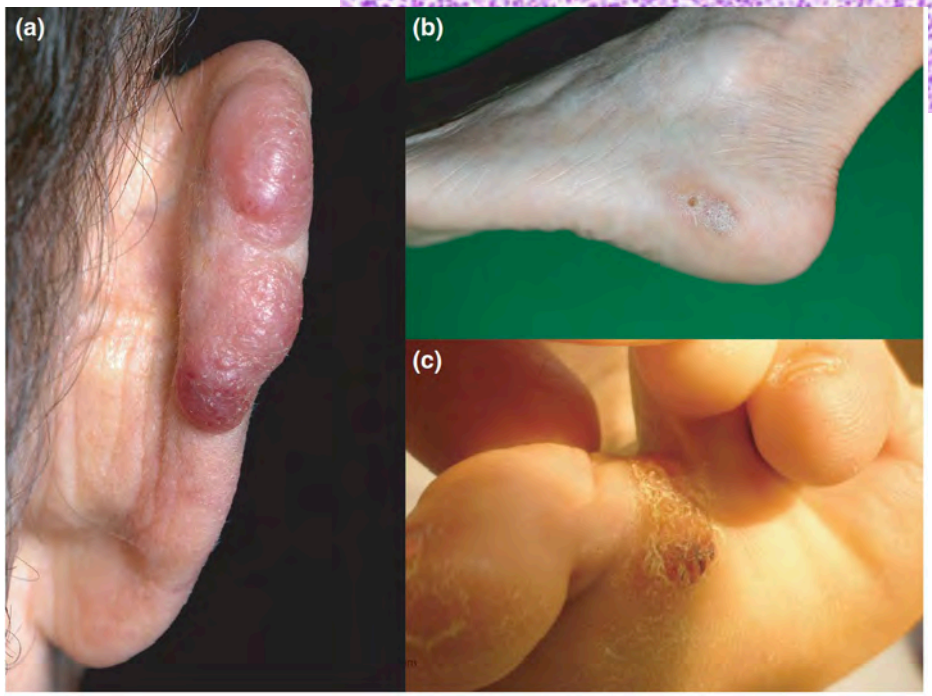
Primary cutaneous NK/T-cell lymphoma

Primary cutaneous T-cell lymphoma (NOS)

Primary cutaneous acral CD8-positive *lymphoproliferative disorder*



- Rare. Mean age 60.
- Most commonly solitary lesions of the head/neck
- Sometimes extremities or trunk
- Treatment
  - Excision 12
  - Local RT 7 (dose?)
  - Topical steroids 6
- CR 100%
- 5 relapsed in skin outside original site

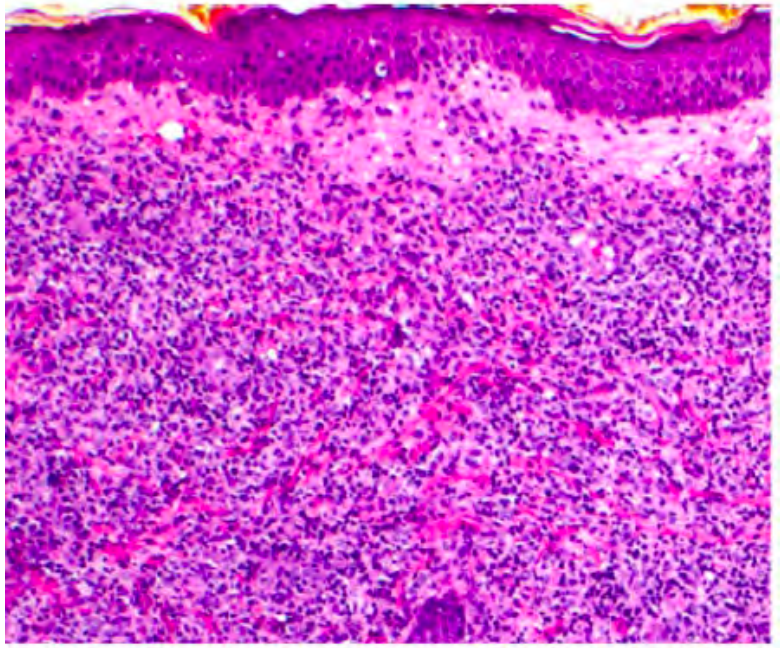


Virmani P et al., *Int J Dermatol* 2016;55:1248-1254. (CoH)

Kempf W et al., Br J *Dermatol* 2022;186:769-771

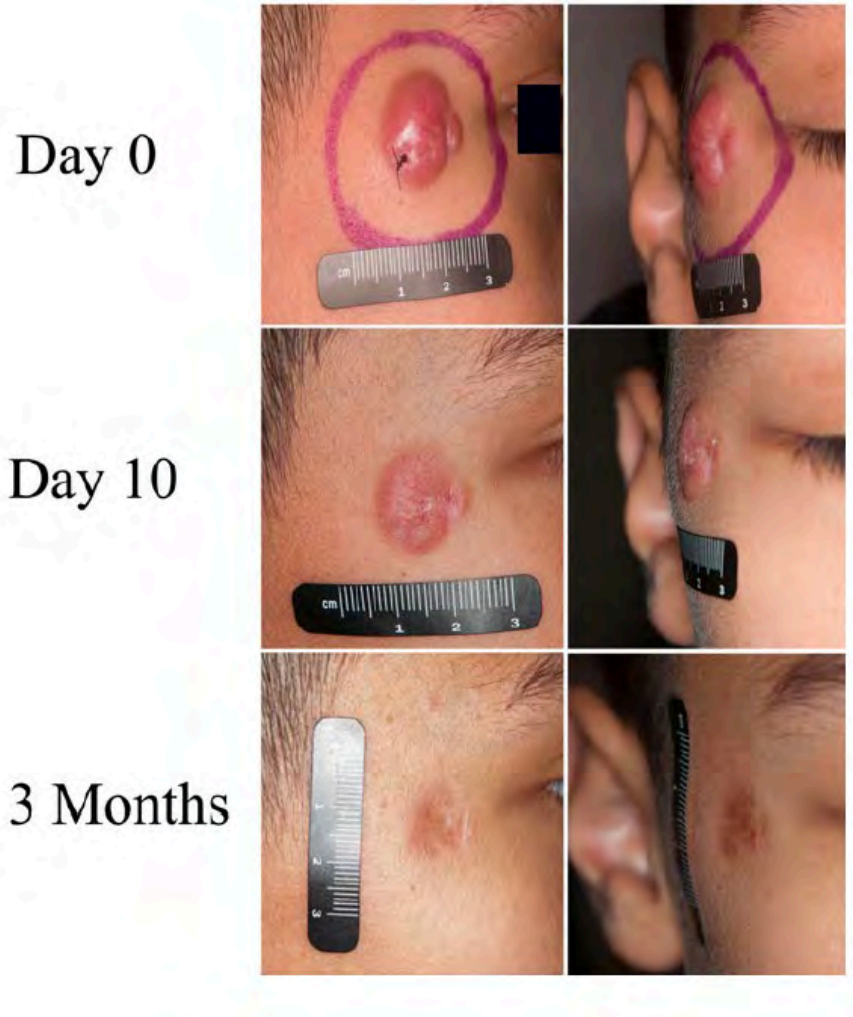
Primary cutaneous CD4-positive small or medium T-cell *lymphoproliferative disorder*

- Rare. Average age 54.
- Single nodule on upper trunk, neck, or face.
- Treatment
  - Topical or intralesional steroids 11
  - Excision 19
  - Radiation therapy 4
- CR 88%. No lymphoma deaths.



Besch-Stokes JG et al., JAAD 2022;86:1167-1169. (Mayo)

Primary cutaneous CD4-positive small or medium T-cell *lymphoproliferative disorder*



Very low dose (4 Gy total dose) may suffice

Kim EJ et al., *Ped Derm* 2019;36:e23-e26 (MDA)

The Less Common CTCLs

Mycosis fungoides

Sezary syndrome

Primary cutaneous CD30-positive T-cell *lymphoproliferative disorder*

- Primary cutaneous anaplastic large cell lymphoma
- Lymphomatoid papulosis

Primary cutaneous acral CD8-positive *lymphoproliferative disorder*

Primary cutaneous CD4-positive small or medium T-cell *lymphoproliferative disorder*

Subcutaneous panniculitis-like T-cell lymphoma

Primary cutaneous gamma/delta T-cell lymphoma

Primary cutaneous CD8-positive aggressive epidermotropic cytotoxic T-cell lymphoma

Primary cutaneous NK/T-cell lymphoma

→ Aggressive

Primary cutaneous T-cell lymphoma (NOS)

The Stanford Cutaneous Lymphoma Team