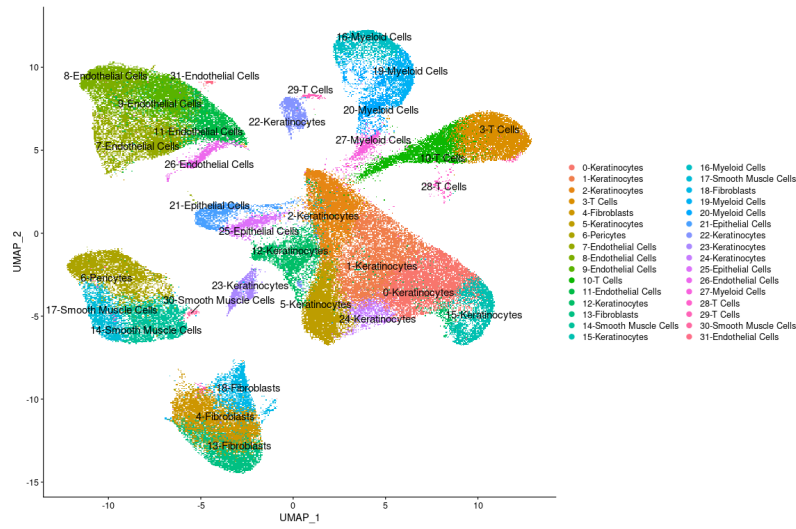
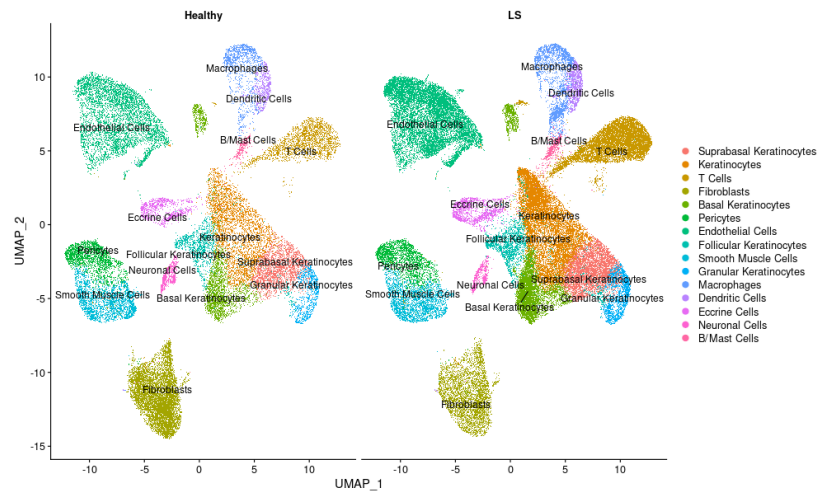
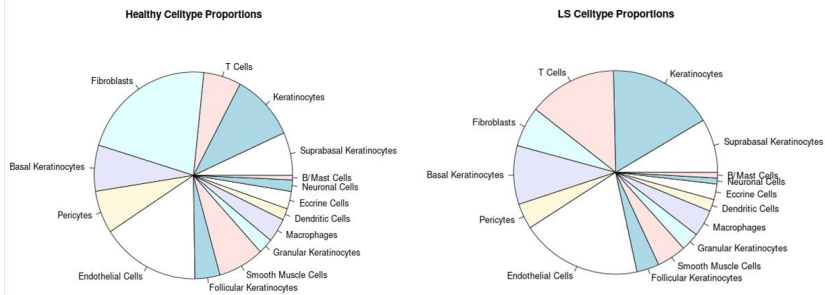


Supplemental Figure 1: Single cell RNA sequencing defines 32 total cell populations in the skin of patients with localized scleroderma compared with age and sex-matched healthy controls. **A)** The initial UMAP of 32 clusters including cell type name is displayed. We later consolidated these clusters in 15 for easier analyses and cellular relations. For example, clusters 7, 8, 9, 11, 26, and 31 are all Endothelial cells sharing core common annotation markers and were labeled collectively as Endothelial cells (*Figure B here*), population 6 in the final clustering, main Figure 1. **B)** Both LS and healthy control subjects have cells populating all cell types, supporting no major sample type skewing. **C)** The cell type composition for the healthy and LS subjects demonstrates higher proportions of T cells, keratinocytes, and endothelial cells, while healthy subjects have more fibroblasts.

A**B****C**

Supplementary Table 1: Demographic information for LS cohort and controls. Pediatric and adult LS cohort with age matched controls. Categories are defined as 1A = adult healthy control; 1B = pediatric healthy control; 2A = adult LS; 2B = pediatric LS

Category	NRCOS	Sample ID	Chemistry	Sample Type	Bx Location	Onset	Age of onset (Yr)	Disease Duration (Yr)	Age at biopsy (Yr)	Gender	Race/Ethnicity	Active/Inactive	Subtype	Antibody Status	LoS4U/mLcSI	LoSDI	PGA-A	PGA-D	PGA-S
1A	adult control	SC50	V2	Fresh	Forearm	Adult	N/A	N/A	64	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC68	V2	Fresh	Forearm	Adult	N/A	N/A	48	F	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC124	V2	Fresh	Forearm	Adult	N/A	N/A	54	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC125	V2	Fresh	Forearm	Adult	N/A	N/A	61	M	African American	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC1	V1	Fresh	Forearm	Adult	N/A	N/A	63	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC4	V1	Fresh	Forearm	Adult	N/A	N/A	63	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC18	V1	Fresh	Forearm	Adult	N/A	N/A	66	F	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	adult control	SC33	V1	Fresh	Forearm	Adult	N/A	N/A	62	F	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	HSK-060	SC407	V3	Cryostor	Breast	Adult	N/A	N/A	18	F	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	1223	SC392	V3	Fresh	Forearm	Adult	N/A	N/A	23	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1A	HSK-056	SC386	V3	Fresh	Breast	Adult	N/A	N/A	21	F	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	SC32	V1	Cryostor	Forearm	Peds	N/A	N/A	23	F	Asian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	SC296	V2	Cryostor	Scalp	Peds	N/A	N/A	5	M	Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	SC297	V2	Cryostor	Midarm	Peds	N/A	N/A	14	F	Hispanic	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	HSK053	V2	Fresh	Breast	Peds	N/A	N/A	18	F	African American/Caucasian	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	HSK054	V2	Fresh	Breast	Peds	N/A	N/A	17	F	African American	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
1B	ped control	PHC003	V2	Cryostor	Midarm	Peds	N/A	N/A	13	F	Hispanic	N/A	Healthy	N/A	N/A	N/A	N/A	N/A	N/A
2A	HJ875	SC445	V3	Cryostor	Abdomen	Adult	27	1	27	F	African American	A	Linear	-	5	2	21	14	-
2A	HJ534	SC446	V3	Cryostor	Abdomen	Adult	57	8	65	M	Caucasian	A	Generalized	-	13	17	32	8	-
2A	HJ 696 (UTSW 5)	SC275	V2	Cryostor	Left flank	Adult	63	2	65	F	Caucasian	A	Isomorphic morphea	unknown	5	32	10	23	-
2A	UTSW1-DSK001	SC222A C	V2	Affected Cryostor	Left abdomen	Adult	-	-	65	M	Caucasian	A/I	Generalized	unknown	14	38	18	18	-
2A	1000	SC260	V2	Fresh	Lower back	Adult	34	13	43	M	Caucasian	I	Circumscribed/Plaque	unknown	0	5	0	18	12
2A	UTSW6	HJ809	V2	Cryostor	Abdomen	Adult	64	1	65	F	Caucasian	A	Generalized	unknown	61	28	90	60	-
2A	UTSW7	HJ867	V2	Cryostor	Right Arm	Adult	54	8	61	F	Caucasian	A	Generalized	unknown	13	39	27	30	-
2A	HJ740	SC408	V3	Cryostor	Abdomen	Adult	62	4	66	F	Caucasian	A	Generalized	-	5	26	4	17	-
2A	HJ861	SC409	V3	Cryostor	Right thigh	Adult	47	0.33	47	F	African American	A	Indeterminate	-	12	17	19	12	-
2A	HJ825/345	SC389	V3	Cryostor	Abdomen	Adult	61	10.8	71	F	Hispanic	A	Linear	-	5	13	8	12	-
2A	HJ 771 (UTSW2)	SC266	V2	Cryostor	Abdomen	Adult	24	13	37	M	Caucasian	A	Linear	unknown	4	34	13	55	-
2A	HJ 773 (UTSW3)	SC267	V2	Cryostor	Left abdomen	Adult	61	2.7	64	F	Caucasian	A	Generalized	unknown	9	14	23	12	-
2A	HJ 656 (UTSW 4)	SC272	V2	Cryostor	Left abdomen	Adult	34	9	43	F	Hispanic	A	Linear	unknown	10	10	23	15	-
2B	474	SC126	V2	Fresh	Upper thigh	Peds	6.3	1.75	8	F	Caucasian	A	Linear	ANA negative, Histone negative, ssDNA negative	17	14	76	35	43
2B	488	SC198	V2	Fresh	Midarm	Peds	13	1.16	14	F	Asian	I	Linear	ANA positive (1:160 homogenous),	0	8	0	18	19
2B	507	SC246	V2	Fresh	Thigh	Peds	12.6	1.15	15	F	Asian	A	Linear	Histone+ ssDNA+ 6/2019: Histone negative,	13	12	62	37	47
2B	494	SC259	V2	Fresh	Scalp/forehead	Peds	7.4	8.3	16	M	Caucasian	A	Linear Face	ssDNA negative	4	4	29	41	45
2B	414	SC144	V2	Fresh	Lower back	Peds	16.6	3.33	20	M	Caucasian	I	Circumscribed	not done at this visit	7	14	0	52	53
2B	555	SC300	V2	Fresh	Scalp/forehead	Peds	4.8	14.4	20	M	Caucasian	A	Linear Face	not done at this visit	3	5	8	47	52
2B	466	SC424	V3	Cryostor	Scalp and Temple	Peds	10	7	17	F	Caucasian	A	Linear Face	negative ANA	0	3	5	51	53
2B	660	SC442	V3	Fresh	Left Calf	Peds	5	8	13	F	Caucasian	A	Linear	not done at this visit	1	10	33	36	38
2B	662	SC443	V3	Fresh	Left buttocks	Peds	13	3	16	F	Caucasian	A	Circumscribed	Positive ANA (homogenous, negative dsDNA, negative RNP)	4	5	46	22	29
2B	669	SC457	V3	Fresh	Arm	Peds	4	1	5	F	Caucasian	A	Pan sclerotic	not done at this visit	52	68	78	81	95
2B	595	SC361	V2	Cryostor	Right Thigh	Peds	10	0.76	11	F	Caucasian	A	Linear	ANA negative, Histone negative	9	6	65	20	42
2B	409	SC388	V3	Cryostor	Upper Back	Peds	10	6.8	16	F	Caucasian	I	Circumscribed	Histone negative	0	4	0	20	18
2B	437	SC391	V3	Fresh	Right thigh	Peds	14	7	21	F	Caucasian	A	Linear	ANA positive (homogenous), histone negative	12	8	35	30	44
2B	673	SC455	V3	Cryostor	Thigh	Peds	11	1.3	13	F	Caucasian	A	Linear	Positive Histone, negative PM1	2	5	14	42	40

Supplemental Table 2: Additional SLIDE latent factors from model used to classify LS and healthy patients.

Additional latent factors chosen by SLIDE for classifying LS and Healthy samples from combined pediatric and adult samples. Latent factor number is used solely to indicate gene membership and does not correspond to any ranking.

Gene	Association	latent factor number	model
C.0.LGALS7	Higher in Healthy	2	LS vs H
C.22.LGALS7	Higher in Healthy	2	LS vs H
C.27.CD44	Higher in Healthy	2	LS vs H
C.12.HOPX	Higher in Healthy	2	LS vs H
C.10.NEAT1	Higher in LS	2	LS vs H
C.23.S100A4	Higher in Healthy	3	LS vs H
C.23.CRYAB	Higher in Healthy	3	LS vs H
C.23.SPARC	Higher in Healthy	3	LS vs H
C.23.PRNP	Higher in Healthy	3	LS vs H
C.23.TUBA1A	Higher in Healthy	3	LS vs H
C.23.GSN	Higher in Healthy	3	LS vs H
C.23.TUBA1B	Higher in Healthy	3	LS vs H
C.23.PSAP	Higher in Healthy	3	LS vs H
C.20.HLAC	Higher in LS	3	LS vs H
C.23.ZFP36L1	Higher in LS	3	LS vs H
C.14.MFAP4	Higher in Healthy	3	LS vs H

Supplemental Table 3: Additional SLIDE latent factors from model used to classify adult LS and adult healthy patients. Additional latent factors chosen by SLIDE for classifying LS and Healthy samples from adult samples. Latent factor number is used solely to indicate gene membership and does not correspond to any ranking.

Gene	Association	latent factor number	model
C.4.COL3A1	Higher in LS	1	Adult LS vs H
C.13.COL3A1	Higher in LS	1	Adult LS vs H
C.13.COL1A1	Higher in LS	1	Adult LS vs H
C.18.COL6A1	Higher in LS	1	Adult LS vs H
C.1.AQP3	Higher in LS	1	Adult LS vs H
C.26.PLAC9	Higher in LS	1	Adult LS vs H
C.17.NFKBIA	Higher in Healthy	1	Adult LS vs H
C.27.DDX5	Higher in LS	1	Adult LS vs H
C.4.NFKBIA	Higher in Healthy	1	Adult LS vs H
C.23.FOS	Higher in Healthy	2	Adult LS vs H
C.23.JUN	Higher in Healthy	2	Adult LS vs H
C.23.JUNB	Higher in Healthy	2	Adult LS vs H
C.23.HES1	Higher in Healthy	2	Adult LS vs H
C.18.CIRBP	Higher in LS	2	Adult LS vs H
C.3.SLC2A3	Higher in Healthy	2	Adult LS vs H
C.23.SK1	Higher in Healthy	2	Adult LS vs H
C.4.TCF4	Higher in LS	3	Adult LS vs H
C.23.EMP3	Higher in Healthy	3	Adult LS vs H
C.25.UQCRH	Higher in LS	3	Adult LS vs H
C.25.EEF1B2	Higher in LS	3	Adult LS vs H
C.25.HNRNPDL	Higher in LS	3	Adult LS vs H
C.25.SNHG8	Higher in LS	3	Adult LS vs H
C.25.HINT1	Higher in LS	3	Adult LS vs H
C.25.S100A6	Higher in LS	3	Adult LS vs H
C.25.PERP	Higher in LS	3	Adult LS vs H
C.20.COX7C	Higher in LS	3	Adult LS vs H
C.20.EEF1B2	Higher in LS	3	Adult LS vs H

Supplemental Table 4: Additional SLIDE latent factors from model used to classify adult and pediatric LS patients.
Additional latent factors chosen by SLIDE for classifying Pediatric and Adult samples in the LS cohort. Latent factor number is used solely to indicate gene membership and does not correspond to any ranking.

Gene	Association	latent factor number	model
C.7.HLADRB5	Higher in Peds LS	1	LS onset
C.8.HLADRB5	Higher in Peds LS	1	LS onset
C.9.HLADRB5	Higher in Peds LS	1	LS onset
C.11.HLADRB1	Higher in Adult LS	1	LS onset
C.20.DDX5	Higher in Peds LS	1	LS onset
C.3.CST7	Higher in Adult LS	1	LS onset
C.9.CTGF	Higher in Adult LS	1	LS onset
C.10.DNAJA1	Higher in Peds LS	1	LS onset
C.5.AREG	Higher in Peds LS	2	LS onset
C.14.RHOB	Higher in Peds LS	2	LS onset
C.17.ZNF331	Higher in Peds LS	2	LS onset
C.17.AVPR1A	Higher in Peds LS	2	LS onset
C.17.CREM	Higher in Peds LS	2	LS onset
C.17.NR4A2	Higher in Peds LS	2	LS onset
C.17.MAT2A	Higher in Peds LS	2	LS onset
C.17.CYCS	Higher in Peds LS	2	LS onset
C.17.EIF4A3	Higher in Peds LS	2	LS onset
C.20.EEF1B2	Higher in Peds LS	3	LS onset
C.20.EEF1D	Higher in Adult LS	3	LS onset
C.20.CYBA	Higher in Adult LS	3	LS onset
C.20.COX7C	Higher in Adult LS	3	LS onset
C.20.ZFAS1	Higher in Adult LS	3	LS onset
C.20.TOMM7	Higher in Adult LS	3	LS onset
C.20.HNRNPA1	Higher in Adult LS	3	LS onset
C.20.RACK1	Higher in Peds LS	3	LS onset
C.20.HLAB	Higher in Adult LS	3	LS onset
C.20.UQCRB	Higher in Adult LS	3	LS onset
C.20.BTF3	Higher in Adult LS	3	LS onset
C.31.ENO1	Higher in Adult LS	6	LS onset
C.31.CDC42	Higher in Adult LS	6	LS onset
C.31.RSRP1	Higher in Adult LS	6	LS onset
C.31.SH3BGRL3	Higher in Adult LS	6	LS onset
C.31.CD52	Higher in Adult LS	6	LS onset
C.31.NDUFS5	Higher in Adult LS	6	LS onset
C.31.YBX1	Higher in Adult LS	6	LS onset
C.31.PRDX1	Higher in Adult LS	6	LS onset
C.31.TMEM59	Higher in Adult LS	6	LS onset
C.31.SERBP1	Higher in Adult LS	6	LS onset
C.7.PLVAP	Higher in Adult LS	6	LS onset

Supplemental Table 5: Additional SLIDE latent factors from model used to regress mLoSSI score for LS patients.
Additional latent factors chosen by SLIDE for regressing mLoSSI score in combined pediatric and adult LS samples.
Latent factor number is used solely to indicate gene membership and does not correspond to any ranking.

Gene	Association	latent factor number	model
C.21.AQP5	Lower MRSS	2	LS LoSAI
C.21.GAPDH	Lower MRSS	2	LS LoSAI
C.21.LDHA	Lower MRSS	2	LS LoSAI
C.21.KRT15	Lower MRSS	2	LS LoSAI
C.21.PDCD4	Lower MRSS	2	LS LoSAI
C.21.CLDN10	Lower MRSS	2	LS LoSAI
C.21.KRT18	Lower MRSS	2	LS LoSAI
C.21.KRT8	Lower MRSS	2	LS LoSAI
C.21.DBI	Lower MRSS	2	LS LoSAI
C.21.NDRG2	Lower MRSS	2	LS LoSAI
C.25.CALML5	Higher MRSS	2	LS LoSAI
C.25.ANXA2	Higher MRSS	2	LS LoSAI
C.26.ANGPT2	Higher MRSS	2	LS LoSAI
C.21.COX7C	Lower MRSS	3	LS LoSAI
C.21.NDUFA4	Lower MRSS	3	LS LoSAI
C.21.FXYD3	Lower MRSS	3	LS LoSAI
C.21.ELOB	Lower MRSS	3	LS LoSAI
C.26.ANGPT2	Higher MRSS	3	LS LoSAI
C.21.KRT7	Lower MRSS	3	LS LoSAI
C.25.CALML5	Higher MRSS	3	LS LoSAI
C.25.UBC	Higher MRSS	5	LS LoSAI
C.25.GAPDH	Higher MRSS	5	LS LoSAI
C.25.NFKBIA	Higher MRSS	5	LS LoSAI
C.25.PTMA	Higher MRSS	5	LS LoSAI
C.25.UQCRB	Higher MRSS	5	LS LoSAI