Supplementary Table S1. Demographic and clinical characteristics of Rheumatoid arthritis patients and healthy controls.

	Rheumatoid arthritis (n=94)	Healthy controls (n=41)
Age, median (IQR)	45 (37-52.5)	43 (35-52)
Gender (F:M)	84:10	33:8
ESR, median (IQR)	45 (24.25-65.5)	
CRP (mg/L), median(IQR)	11.6 (5.11-34.6)	
SJC28	4.5 (2-7)	
TJC28	13.5 (8-19.8)	
DAS28-ESR, median(IQR)	5.75 (4.95-6.62)	
RF+ (%)	91%	
ACPA+ (%)	67%	

ACPA: anticitrullinated peptide antibody; ESR: erythrocyte sedimentation rate; DAS28-ESR: modified disease activity score based on 28 joints; RF: rheumatoid factor; SJC28: swollen joint count of 28 joints; TJC28: tender joint count of 28 joints.

Supplementary Table S2. Demographic and clinical characteristics of naïve rheumatoid arthritis patients who were undergoing arthrocentesis.

	naive RA (n=19)
AGE, median (IQR)	38 (32-48.75)
Gender (F:M)	16:3
ESR, median (IQR)	61 (42-92)
CRP, mg/L, median (IQR)	29.85 (21.25- 49.38)
SJC28	6 (4-7)
TJC28	11 (8-20.5)
DAS28-ESR, median (IQR)	6.22 (5.625- 6.65)
RF (%)	94.7%
Anti-CCP (%)	63.1%

ACPA: anticitrullinated peptide antibody; ESR: erythrocyte sedimentation rate; DAS28-ESR: modified disease activity score based on 28 joints; RF: rheumatoid factor; SJC28: swollen joint count of 28 joints; TJC28: tender joint count of 28 joints.

Supplementary Table S3. List of surface marker and intracellular antibodies used, Biolegend (CA, USA).

Marker	Fluorochrome	Catalogue no.
CD3	PERCpCy 5.5	300316
CD8	PE/CY7	301032
GMCSF	PE	502306
IFN-γ	FITC	506504
TNF-α	APC	502913
IL-17A	BV421	512322
CCR7	FITC	353215
CD45RA	APC	304112
Perforin	BV421	308121
Granzyme- B	FITC	396403
Fixable Live/ Dead	Zombie NIR Dye (APC-H7)	423105

Supplementary Table S4. Levels of GMCSF and IFNγ in the serum and synovial fluid of RA patients.

	RA SF (n=32) Pg/ml	SpA SF (n=30) Pg/ml	*p*-value RA *vs*. SpA SF	RA serum (n=16) Pg/ml	*p*-value RA serum *vs*. SF
GMCSF	9.51 (6.59-11.68)	6.55 (4.36-8.28)	**0.0097**	3.16 (2.51-3.85)	**<0.0001**
IFNγ	9.07 (4.75- 15.65)	14.94 (3.63-25.05)	0.087		

Supplementary Table S5. Polyfunctionality of GMCSF producing T cells in the PB and SF after *ex-vivo* stimulation.

	CD8+GMCSF+			CD4GMCSF+		
	SF (%) (n=17)	PB (%) (n=17)	*p*-value	SF (%) (n=17)	PB (%) (n=17)	*p*-value
IFN+TNF+IL17-	80.5 ± 130.3	36.4 ± 23.5	**0.049**	47.9 ± 12.2	32.5 ± 20.9	**0.015**
IFN+TNF+IL17+	3.3 ± 4	1.1 ± 1	**0.011**	2.6 ± 7.2	1.4 ± 2.2	0.679
IFN+TNF-IL17-	9 ± 7	10.9 ± 2.5	0.163	2.5 ± 3.8	6.5 ± 9.3	**0.049**
IFN+TNF-IL17+	1.3 ± 1.5	0.8 ± 1.2	0.098	0.4 ± 1.1	1.2 ± 4.3	0.861
IFN-TNF+IL17-	11.3 ± 7.8	17.5 ± 13	**0.022**	32.4 ± 9	24.3 ± 16.4	0.084
IFN-TNF+IL17+	2 ± 1.9	0.7 ± 0.8	0.002	2.5 ± 2.4	2 ± 1.8	0.687
IFN-TNF-IL17-	19.6 ± 21.6	33.4 ± 22.2	**<0.001**	2.4 ± 3.6	1.2 ± 1.4	0.062
IFN-TNF-IL17+	5.5 ± 8	1 ± 1.6	0.062	10.4 ± 7.8	31.7 ± 27.6	**0.009**

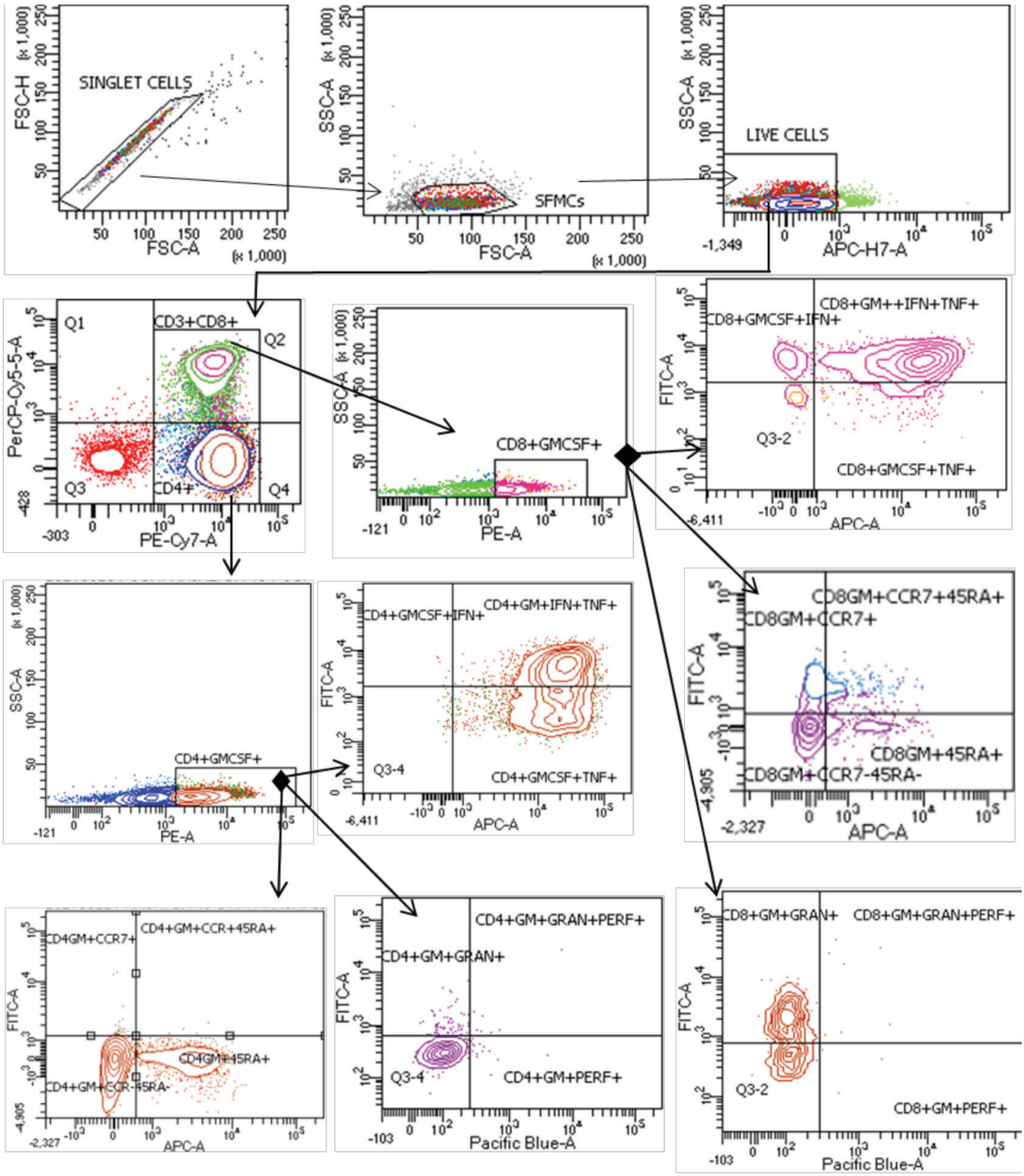
Supplementary Table S6. Memory phenotype of GMCSF producing T cells.

	CD8+GMCSF+			CD4+GMCSF+		
Memory subset	SF (n=22)	PB (n=22)	*p*-value	SF (n=22)	PB (n=22)	*p*-value
Effector memory	61.5 (47.1-84.4)	41.8 (27-61.5)	**0.0042**	88.6 (79.9- 92.2)	71.9 (52.7- 87.7)	**0.0066**
Central memory	23.8 (10.8-34.6)	8.7 (7- 21)	**0.019**	5.3 (3- 10.8)	7.5 (3.6- 31.6)	**0.0223**
Naïve	2.4 (1.2-5.1)	6.5 (2.3-16.3)	**0.0078**	0.6 (0.2-1.4)	1.3 (0.5- 4.6)	**ns**
TEMRA	2.3 (0.8-7.6)	26.6 (14.5-38.6)	**<0.0001**	2.1 (0.7- 3.8)	6.9 (2.4- 10.4)	**0.0290**

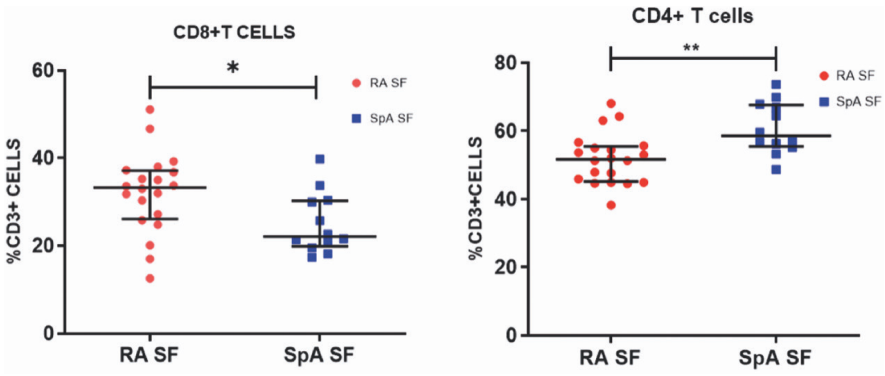
Effector memory cells: CCR7-45RA-; Central memory: CCR7+45RA-; Naive: CCR7+45RA+, TEMRA (effector memory T cells re-expresses CD45RA, CCR7-CD45RA+).

Supplementary Table S7. Cytotoxic potential of GMCSF producing T cells.

	CD8+GMCSF+			CD4+GMCSF+		
	PB (n=15)	SF (n=15)	*p*-value	PB (n=15)	SF (n=15)	*p*-value
Granzyme B$^+$	17.6 11.8-23.5)	37 (22.4-41.1)	**0.0043**	6 (2.7-10.8)	7.1 (4-9.2)	0.82
Perforin$^+$ & Granzyme B$^+$	16.2 (5.2- 35.3)	10.2 (3.4-18.8)	0.4212	4.4 (2.4-6.2)	2.1 (1.1-4)	0.252
Perforin$^+$	4.6 (2.2-11.8)	4.9 (2.7- 12.5)	0.4975	5.4 (1.2-19.4)	4.7 (1.8-7.0)	0.057



Supplementary Fig. S1. Gating strategy for GMCSF producing T cells, polyfunctional production of other cytokines, memory/naive phenotype based on CCR7/CD45RA and cytotoxic ability (perforin/granzyme) in synovial fluid.
First we gated for singlets, then SFMC based on surface scatter (SSc *vs*. FSc), then for live cells, then gated CD3+CD8+, then gated for expression of GMCSF, then looked at TNF and IF N expression in these cells. CD3+CD8- T cells were taken as CD4+ T cells and gated similarly.



RA: rheumatoid arthritis synovial fluid; SpA: spondyloarthrits synovial fluid.

Cell subset	RA SF (n=20)	SpA SF (n=12)	*p*-value
CD3+CD8+	33 (26.15-37.18)	22.15 (19.85-30.3)	**0.0284**
CD8+GMCSF+	5.45 (4.32-7.02)	4.4 (3.4-6.3)	0.3022
CD3+CD4+	52.2 (46.1- 58.2)	58.65 (55.48-67.65)	**0.0022**
CD4+GM-CSF+	4.45 (2.9- 6.27)	5.2 (3.55-12.23)	0.1045

Supplementary Fig. S2. Synovial fluid frequencies of GMCSF+T-cells in RA *vs*. SpA.