

Supplementary File 6. Summary of studies reporting on the association between breast implant rupture and risk of rheumatic disease. A cohort study by Fryzek et al. did not find any association between implant leakage requiring surgical intervention and new rheumatic symptoms, but reported an increased risk of Raynaud's phenomenon and myalgias among those requiring capsulotomy, implant change or surgical intervention for implant leakage. A cross-sectional study by Brown et al. reported no association between implant rupture on magnetic resonance imaging (MRI) and CTDs, but found an increased odds of fibromyalgia and Raynaud's phenomenon among patients with extracapsular silicone on MRI; however, whether these conditions preceded breast implantation and/or rupture was unknown, and these findings were not replicated in a similar study by Holmich et al. Other studies have not found any association between implant rupture on MRI and rheumatic symptoms, but were limited by small numbers or selection bias. No study specifically assessed the association between acute rupture of breast implants and risk of incident rheumatic disease.

Study (Year) Location, study period	Category	No. with ruptured breast implants	No. with intact breast implants	Measure of effect	Time since implant	Notes	NOS	\$		
Fryzek et al. (2001) Sweden, 1969-1996	A) Implant leakage	A) 130	884 with no local complication	OR (95% CI NR); p<0.05 if bolded	13 years (mean)	- Retrospective cohort - Swedish inpatient registry - Local complications included: capsulotomy, implant change, implant leakage - Adjusted for age, parity, smoking, body mass index, university health care, alcohol, time since operation - Not adjusted for multiple comparisons - Self-reported symptoms	7	Yes		
	B) Any local complication	B) 396								
	Painful joint >3 months	-							A) 1.1; B) 1.2	
	Swollen joints >1 week	-							A) 0.6; B) 1.1	
	Muscle pain >3 months	-							A) 0.9; B) 1.3	
	Muscle weakness	-							A) 0.6; B) 1.0	
	Chronic neck ache	-							A) 1.2; B) 1.1	
	Chronic shoulder ache	-							A) 0.8; B) 1.1	
	Chronic backache	-							A) 0.8; B) 1.0	
	Abnormal fatigue	-							A) 0.8; B) 1.1	
	Regularly burning eyes	-							A) 0.5; B) 1.3	
	Persistent dry eyes	-							A) 0.8; B) 1.0	
	Sand/gravel in eyes	-							A) 0.5; B) 1.2	
	Dry mouth >3 months	-							A) 0.6; B) 1.2	
	Mouth ulcers >3 weeks	-							A) 0.0; B) 2.0	
	Difficulty swallowing	-							A) 0.7; B) 0.8	
	Redness of cheeks	-							A) 0.4; B) 1.0	
Photosensitivity	-	A) 0.4; B) 0.9								
Attacks of impaired circulation toes/fingers	-	A) 1.4; B) 1.5								
Unexplained fever	-	A) 0.8; B) 1.3								
Holmich et al. (2003) Denmark, 1997-1999	A) Any rupture	A) 92	146	OR (95% CI)	14 years (mean)	- Cross-sectional study - Randomly selected women with SBI from plastic surgery practices (3 private clinic, 1 public hospital) - MRI-confirmed rupture - Self-reported symptoms and diagnoses - Adjusted for age; implant age, placement, type; manufacturer; site of surgery	7	Yes		
	B) Extracapsular rupture	B) 23								
	Connective tissue diseases	A) 2 B) 2 (RA, Sjögren)							3 (2 RA, 1 SLE)	A) 0.9 (0.1-6.7) B) 3.8 (0.4-35.1)
	Indefinite CTD and other chronic inflammatory diseases	A) 10 (1 FM) B) 2							11 (1 FM)	A) 1.0 (0.3-3.0) B) 0.8 (0.1-4.5)
	Unspecified neck, shoulder or back pain	A) 43 B) 11							55	A) 1.0 (0.5-1.8) B) 1.2 (0.4-3.5)
	Joint pain, swelling or stiffness >3 months	A) 25 B) 4							37	A) 0.6 (0.3-1.3) B) 0.5 (0.2-1.8)
	Muscle pain or weakness > 3 months	A) 17 B) 7							30	A) 0.5 (0.2-1.2) B) 1.4 (0.4-4.6)
	Mouth/eye symptoms	A) 16 B) 6							22	A) 0.6 (0.3-1.4) B) 1.1 (0.3-3.7)
	White fingers after cold exposure, hair loss	A) 12 B) 4							21	A) 0.6 (0.3-1.6) B) 0.7 (0.2-3.0)
	Fatigue	A) 16 B) 6							25	A) 0.7 (0.3-1.6) B) 1.7 (0.5-5.9)
Mean number of groups of symptoms	A) 2.6 B) 3.2	2.4	A) P = 0.50 B) P = 0.18							
Brown et al. (2001) United States, 1997-1998	A) Ruptured implants	A) 236	A) 108	OR (95% CI)	16.5 years (mean)	- Cross-sectional study - 2 plastic surgery practices - MRI-confirmed rupture - Unclear if incident or prevalent disease - Self-reported physician diagnoses - Adjusted for implant age and multiple comparisons	5	No		
	B) Extracapsular silicone	B) 73	B) 271							
	Systemic sclerosis	A) 1.3%; B) 0.0%	A) 0.0%; B) 1.1%						A) NS; B) NS	
	SLE	A) 3.0%; B) 1.4%	A) 1.4%; B) 0.7%						A) NS; B) NS	
	Sjögren's/sicca	A) 0.9%; B) 1.4%	A) 0.9%; B) 0.7%						A) NS; B) NS	
	Raynaud's	A) 3.8% B) 8.2%	A) 4.6% B) 2.9%						A) NS B) 3.4 (1.0-10.9)	
	Other CTD*	A) 6.4% B) 12.3%	A) 3.7% B) 3.7%						A) NS B) 3.9 (1.4-10.7)	
	Fibromyalgia	A) 13.1% B) 24.7%	A) 14.8% B) 10.7%						A) NS B) 2.8 (1.4-5.6)	
Chronic fatigue syndrome	A) 8.5% B) 9.8%	A) 10.2% B) 8.9%	A) NS B) NS							

Gaubitz et al. (2002) Germany,	A) Ruptured BI B) Silicone in liver	A) 24 A) 28	A) 66 B) 62	P value	Ruptured: 11.2 years Intact: 8.2 years (mean)	- Cross-sectional study - Consecutive women, gynecology outpatient clinic - MRI-confirmed rupture - Incident disease only - No adjustment	5	No
	Rheumatoid arthritis	0	0	-				
	CTD	0	0	-				
	Fibromyalgia	0	0	-				
	Arthralgias	A) 19; B) 23	A) 49; B) 45	A) NS; B) NS				
	Swollen joints	A) 8; B) 11	A) 20; B) 17	A) NS; B) NS				
	Myalgias	A) 14; B) 13	A) 36; B) 37	A) NS; B) NS				
	Fatigue	A) 11; B) 14	A) 31; B) 28	A) NS; B) NS				
	Photosensitivity	A) 10; B) 16	A) 25; B) 19	A) NS; B) 0.017				
	Dry eyes	A) 9; B) 14	A) 23; B) 28	A) NS; B) NS				
Raynaud's	A) 6; B) 10	A) 19; B) 15	A) NS; B) NS					
Holmich et al. (2004) Denmark, 1999-2001	All women	64	98		12 years (median)	- Prospective cohort - Women with cosmetic silicone BI from 3 private clinics and 1 hospital who underwent MRIs in 1999 and 2001 - Excluded patients with explantation between 1 st and 2 nd MRI - MRI-confirmed rupture - Incident disease - Self-reported symptoms - Short (3-year) observation timeframe	4	Yes
	SLE	0	1	-				
	Sjögren's syndrome	0	1	-				
	Diffuse muscular pain	1	0	-				
Contant et al. (2002) Netherlands, 1995-1997	All implants	3	84		1 year	- Prospective cohort - Women with immediate silicone BI reconstruction post-mastectomy - MRI-confirmed rupture - Short follow-up	4	NR
	Keratoconjunctivitis sicca	0	-	-				
	Swollen, painful and stiff joints	0	-	-				
	Raynaud's	0	-	-				
Khoo et al. (2019) Australia, 2000-2017	All women	9	21	P value	16.1 years (mean)	- Retrospective cohort - Rheumatology clinic (one hospital center) - Includes 17 patients with systemic autoimmune rheumatic diseases - Unclear how rupture was confirmed	4	No
	Fibromyalgia, chronic fatigue syndrome or depression	4	8	1				
	Systemic sclerosis (limited cutaneous)	3	4	-				
	Sjögren's syndrome	2	2	-				
	SLE	0	1	-				
	Rheumatoid arthritis	1	2	-				
	Myositis	1	1	-				
	Spondyloarthropathy	0	3	-				
Berner et al. (2002) Germany, 1984-1996	All women	13	19	P value	6.9 years (mean)	- Cross-sectional study - Patients with breast cancer and MRI exam - Self-reported symptoms - Unclear if incident or prevalent symptoms	3	No
	Swelling of fingers	30.8%	33.3%	NS				
	Change of colour/ paleness of fingers	23.1%	38.9%	NS				
	Dry oropharynx	46.2%	27.8%	NS				
	Dry eyes	23.1%	11.1%	NS				
	Arthralgia	69.2%	61.1%	NS				
	Myalgia	53.8%	50%	NS				
	Photosensitivity	38.5%	33.3%	NS				
	Energy loss	33.3%	38.5%	NS				
Spendel et al. (1998) Austria, 1987-1995	All women	12	22		Ruptured: 11.3 years Intact: 5.4 years (mean)	- Cross-sectional study - Source population NR - Rupture confirmed by mammography, ultrasound or clinically	3	NR
	Joint pain	1 (8.3%)	1 (4.5%)	-				
	Muscle pain	0	1 (4.5%)	-				
Vermeulen and Scholte (2003) Netherlands, 1998	All women	131	45	OR (95% CI)	NR	- Cross-sectional study - Readers of silicone implant support group with 2 nd BI surgery - Similar birth year, no other adjustments - Unclear if incident or prevalent disease - Self-reported symptoms	1	NR
	Debilitating chronic fatigue	75%	51%	2.8 (1.4-5.8)				
	Post-exertional malaise for over 24 hours	76%	51%	3.1 (1.5-6.3)				
	Muscle pain	77%	64%	1.9 (0.9-3.9)				
	Multi-joint pain	77%	60%	2.2 (1.1-4.6)				

*Other CTD: dermatomyositis, polymyositis, Hashimoto's thyroiditis, mixed CTD, pulmonary fibrosis, eosinophilic fasciitis, polymyalgia. BI: breast implant; CI: confidence interval; CTD: connective tissue disease; MRI: magnetic resonance imaging; N/A: not applicable; NOS: Newcastle-Ottawa scale (range 0 to 9); NR or - : not reported; NS: not statistically significant; OR: odds ratio; SLE: systemic lupus erythematosus; \$: potential financial or other conflict of interest.