

TABLE E-1 Characteristics and Results of the Studies Included in the Systematic Review*

Study	LOE	Fractures	No. of Smokers	No. of Nonsmokers	Fractures Studied	Fracture Stabilization	Mean Follow-up	Soft-Tissue Complications	Bone-Healing Complications
Adams ¹⁴	III	273	140	133	Open tibia	IMN, ex. fix., or cast	21.6 mo	STSGs and flaps required: 33 and 35 in smokers, 30 and 29 in nonsmokers. Superficial infections: 21 in smokers, 13 in nonsmokers. Deep infections: 14 in smokers, 14 in nonsmokers.	Mean time to union, in wk: 32.3 in smokers, 27.8 in nonsmokers (p < 0.05). Nonunions: 46 in smokers, 33 in nonsmokers
Alemдарođlu ²⁹	II	32	13	18	Tibial shaft	Circular ex. fix.	6 mo	NR	Mean time to union, in wk: 27.54 ± 11.609 in smokers, 21.37 ± 5.079 in nonsmokers
Bowen ²⁸	III	162	57	89	Open long bone	NR	354 d	Tobacco use was associated with increased infections (OR = 3.21, 95% CI = 1.21-8.57, p = 0.02). Infections: 13 in smokers, 7 in nonsmokers	NR
Castillo ¹⁵	II	268	105	163	Open tibia	NR	24 mo	Wound infections: 24.8% in current smokers, 13.4% in former smokers, 14.8% if never smoked. Osteomyelitis: 17.1% in current smokers, 13.4% in former smokers, 4.9% if never smoked	Unhealed at 24 mo: 24.1% in current smokers, 11% in former smokers, 9.9% if never smoked. Time to healing, in wk: 42.9 in current smokers, 47.8 in former smokers, 40.1 if never smoked
Enninghorst ¹⁶	II	89	23	66	Open tibia	IMN, ex. fix., ORIF, or cast	12 mo	OR for infection = 1.05 (95% CI = 0.3-3.7), p = 0.94. Infections: 4 in smokers, 11 in nonsmokers	Nonunions: 10 in smokers, 16 in nonsmokers
Giannoudis ¹⁷	III	99	31	68	Femoral shaft	IMN	NR	NR	Nonunions: 45% in smokers, 26% in nonsmokers. OR for nonunion = 2.29 (95% CI = 0.85-6.08), p = 0.107
Green ²⁴	III	29	10	18	Humeral shaft	Multiple	NR	NR	36% of patients with nonunion were smokers. (Nonunion = healing delayed beyond 24 wk)
Harvey ¹⁸	III	110	62	48	Open tibial shaft	IMN or ex. fix.	NR	Fix. pin-site complications requiring antibiotics or debridement: 46% in smokers, 60% in nonsmokers (p = 0.35). Deep infections: 13% in smokers, 16% in nonsmokers (p = 0.46)	Union rate: 84% in smokers, 94% in nonsmokers (p = 0.10). Nonunions: 10 in smokers, 3 in nonsmokers. Late bone-grafting: 18% in smokers, 10% in nonsmokers (p = 0.09)
Johnston ²⁶	II	3617	467	3150	Hip fix.	NR	12 mo	Superficial infections: 7 (1.5%, 95% CI = 0.6%-3.1%) in smokers, 59 (1.9%, 95% CI = 1.4%-2.4%) in nonsmokers (p = 0.705). Deep infections: 2 (0.4%, too few for CI calculation) in smokers, 21 (0.7%, 95% CI = 0.4%-1%) in nonsmokers (p = 0.770)	NR

continued

TABLE E-1 (continued)

Study	LOE	Fractures	No. of Smokers	No. of Nonsmokers	Fractures Studied	Fracture Stabilization	Mean Follow-up	Soft-Tissue Complications	Bone-Healing Complications
Krannitz ³⁰	III	52	27	25	Ankle	Cast or ORIF	Union + 4 wk	NR	Mean time to cortical bridging in Group 1 (cast), in d: 96.86 (95% CI = 56-175) in smokers, 80.67 (95% CI = 49-140) in nonsmokers. Mean time to cortical bridging in Group 2 (ORIF), in d: 54.92 (95% CI = 43-80) in smokers, 42.46 (95% CI = 35-57) in nonsmokers
Kyrö ¹³	III	135	71	64	Tibial shaft	Initially nonop., ORIF at 4 mo	Until union	NR	Mean time to union: 133 d (19 wk) in smokers, 115 d (16.4 wk) in nonsmokers. Nonunions: 36 in smokers, 20 in nonsmokers
Ristiniemi ²⁰	III	47	16	31	Distal tibia	Hybrid ex. fix.	Until union	NR	Delayed unions: 7 in smokers, 5 in nonsmokers
Schmitz ²³	II	151	76	75	Type-1 open tibial shaft	IMN, ex. fix., or cast	Until union	Smokers: 2 delayed infections, 2 peroneal palsies, 1 skin necrosis, 1 RSD in smokers. Nonsmokers: 1 compartment syndrome, 2 peroneal palsies, 1 RSD	Clinical time to union: 269 d (38.4 wk) in smokers, 136 d (19.4 wk) in nonsmokers. Radiographic time to union: 244 d (34.9 wk) in smokers, 144 d (20.6 wk) in nonsmokers
Shivarathre ³⁵	III	92	10	82	Ankle	ORIF	9 mo	More wound complications in smokers (risk ratio = 3.3)	NR
Taitsman ²¹	III	138	55	83	Femur	IMN	12 wk	NR	Nonunions: 27 in smokers, 19 in nonsmokers
Ziran ²²	III	59	31	28	Foot and ankle, humerus, femur, tibia	ORIF	47 wk	NR	Healing in acute fracture group: <65% in smokers, 82% in nonsmokers. Nonunions in acute fracture group: 11 in smokers, 5 in nonsmokers
Moghaddam ¹⁹	II	85	46	39	Tibia	Cast, ex. fix., IMN, or plate	40 mo	No difference in postop. infections	Timely healing: 28 (61%) in smokers, 36 (92%) in nonsmokers. Delayed unions: 9 in smokers, 3 in nonsmokers. Nonunions: 9 in smokers, 0 in nonsmokers. Time to healing, in wk: 17.4 (95% CI = 8-63) in smokers, 11.9 (95% CI = 8-32) in nonsmokers (p = 0.0032)
Askew ²⁵	III	30	21	9	Femur, tibial shaft	Multiple	NR	NR	Time to healing, in wk: 15.8 ± 2.9 in smokers, 18.2 ± 5.9 in nonsmokers

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Study	LOE	Fractures	No. of Smokers	No. of Nonsmokers	Fractures Studied	Fracture Stabilization	Mean Follow-up	Soft-Tissue Complications	Bone-Healing Complications
Nåsell ²⁷	II	906	185	721	Ankle	ORIF or "other"	6 wk to 11 yr	<p>Higher rate of deep infection in smokers (OR = 6.95, 95% CI = 2-18.7, p = 0.001).</p> <p>Deep infections: 9 (5%) in smokers, 6 (0.8%) in nonsmokers.</p> <p>Higher rate of superficial infections (OR = 1.7, 95% CI = 1.01-2.9, p = 0.05).</p> <p>Superficial infections: 27 (15%) in smokers, 69 (10%) in nonsmokers</p>	NR

*LOE = Level of Evidence, IMN = intramedullary nail, ex. fix. = external fixation, STSG = split-thickness skin graft, NR = not reported, ORIF = open reduction and internal fixation, and RSD = reflex sympathetic dystrophy.