

Negative Pressure Wound Therapy versus Conventional Dressing in Lower Limb Fractures: Systematic Review and Meta-analysis

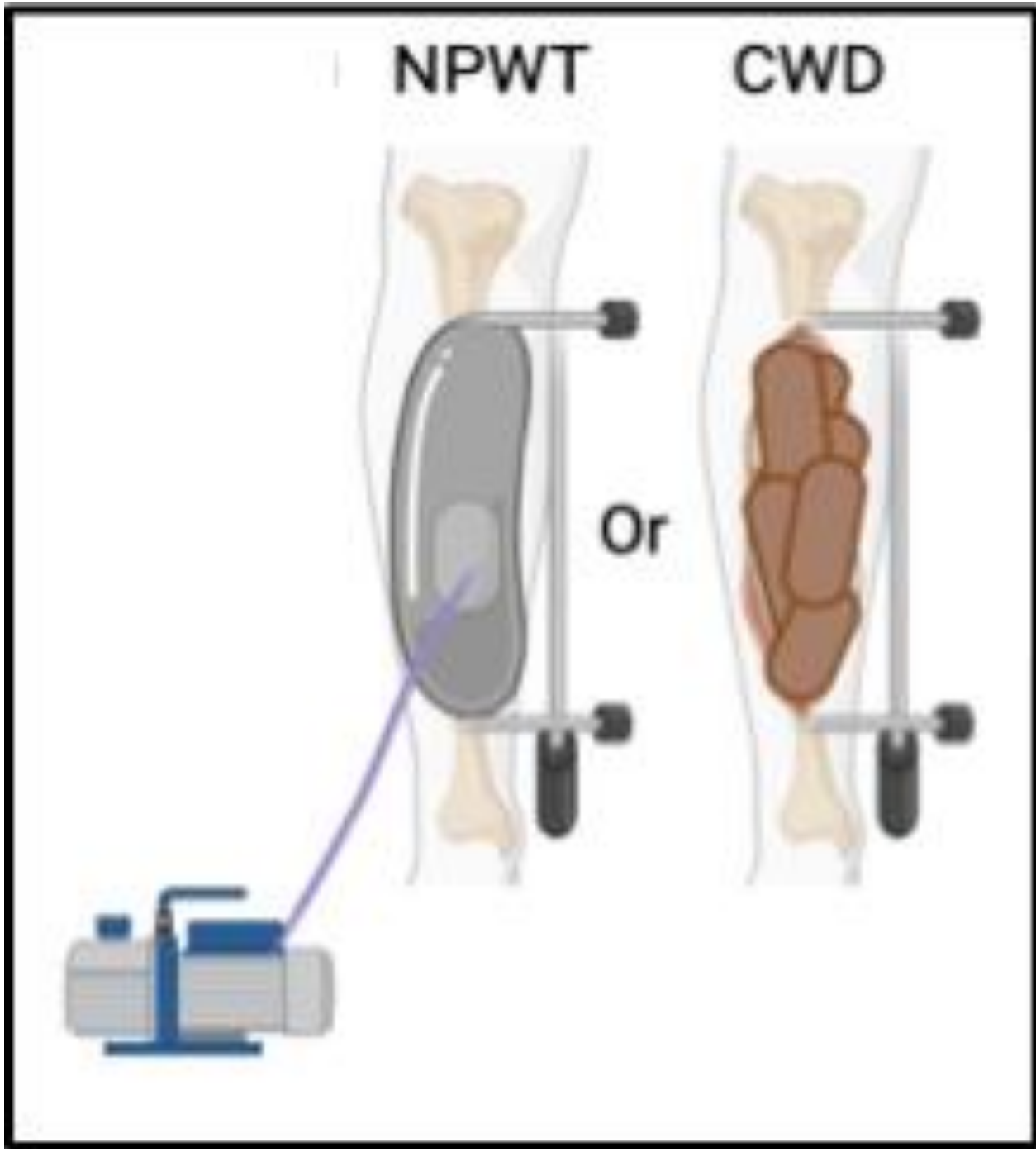
André S. Alves, Jérôme Martineau, Matteo Scampa, Daniel F. Kalbermatten, Carlo M. Oranges

1. Introduction

Two main strategies for wound coverage until final closure:

Conventional Wound Dressing (CWD): **easier** to apply, **seals** the wound, and **absorbs** exudate.

Negative Pressure Wound Therapy (NPWT): enhances **blood flow**, reduces **edema**, promotes **wound healing**



2. Study Selection

9 articles: 5 RCT, 4 RS

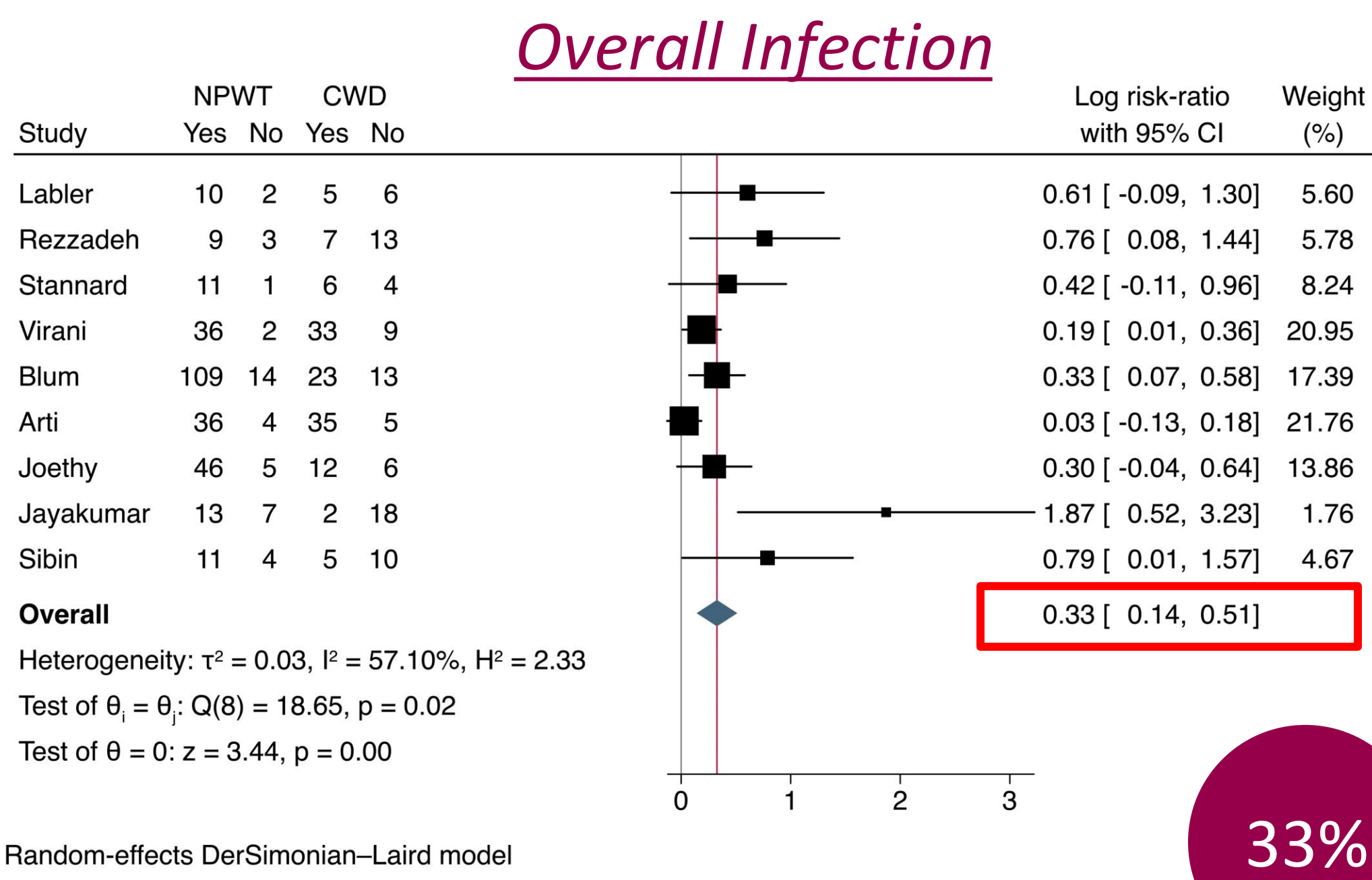
- **535** lower limb fractures classified as Gustilo 3
- **323** managed with **NPWT** and **212** with **CWD**.
- Wound size **63-192cm²**

Table 1. Characteristics of the Selected Studies

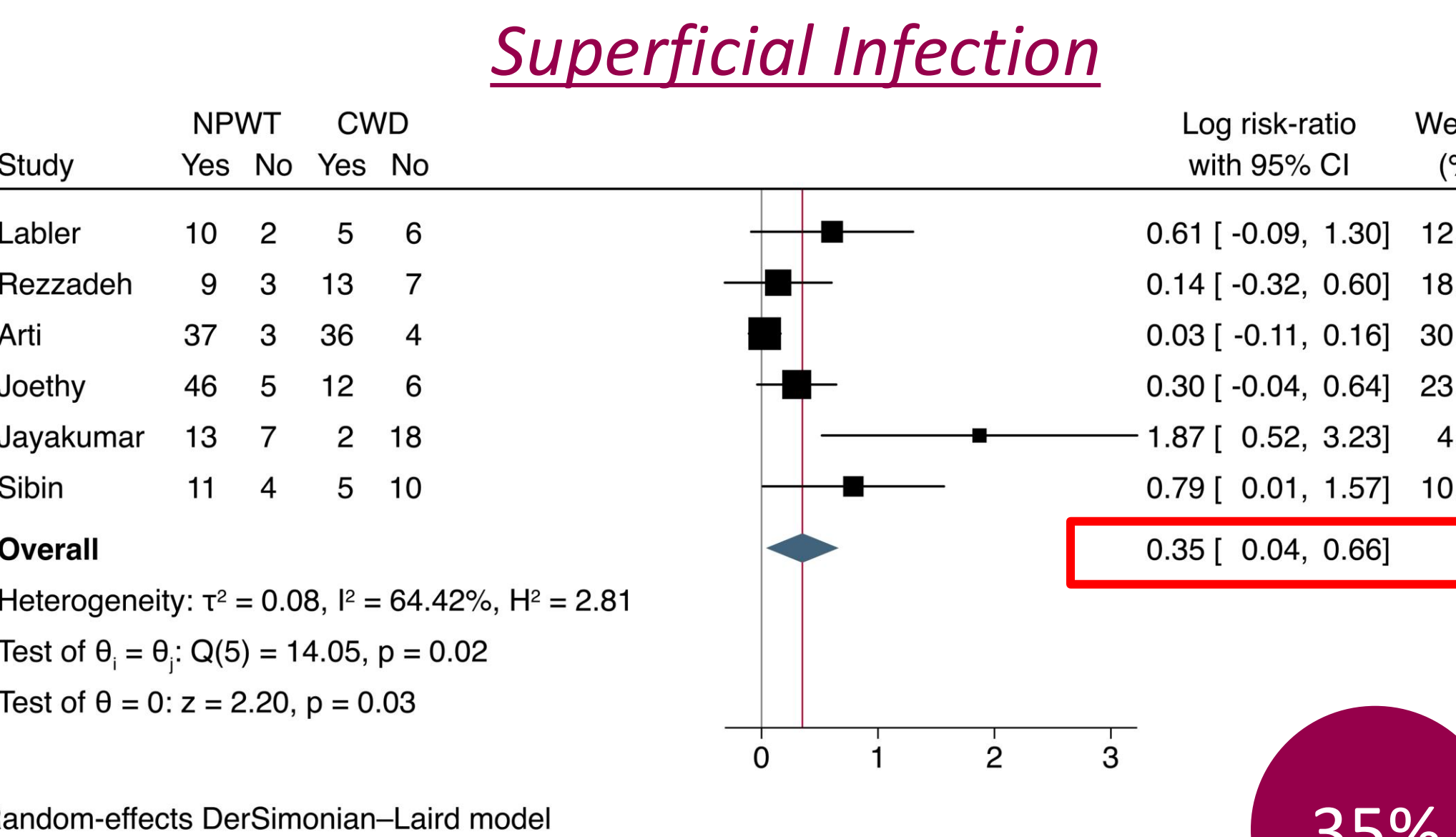
Author	Year	Country	Design	Gustilo	Limb	Fractures (n)	NPWT (n)	CWD (n)	Definition NPWT	Definition CWD	Reconstruction Method	Definition Superficial Infection	Definition Deep Infection	Soft-tissue Reconstruction NPWT, Mean Days	Soft-tissue Reconstruction CWD, Mean Days
Labler	2004	Switzerland	RS	IIa, IIb	Femur, knee, tibia, foot	23	12	11	VAC (KCI) (125)	Epigard	Delayed closure, skin graft, flap	Soft-tissue infection		12.3 (2–35)	4.1 (2–8)
Rezzadeh	2015	The United States	RS	IIb, IIc	Tibia	32	12	20	NPWT	WDD	Flap	Surgical site infection	Osteomyelitis		
Stannard	2009	The United States	RCT	IIa, IIb, IIc	Tibia	22	12	10	VAC (KCI) (125)	WMD	Delayed closure, skin graft, flap		Osteomyelitis		
Virani	2016	India	RCT	IIa, IIb, IIc	Tibia	80	38	42	VAC (125)	WD 1×/24 h	Delayed closure, skin graft, flap	Wound infection	Osteomyelitis	8.3*	9.8*
Blum	2012	Australia	RS	IIa, IIb, IIc	Tibia	159	123	36	VAC (KCI) (125)	WDD	Delayed closure, skin graft, flap	Above deep fascia	Below deep fascia	4.9 (3–7)*	3.3 (2–5)*
Arti	2016	Iran	RCT	IIb	Tibia, fibula, femur	80	40	40	VAC (125)	WD 2×/24 h	Skin graft, flap	Clinical or positive culture of the wound		9.7 (7–12)*	11.2 (8–14)*
Joethy	2013	Singapore	RS	IIb	Tibia	69	51	18	VAC (125)	WD 1×/72–96 h	Flap	Clinical		10.8	16.8
Jayakumar	2013	India	RCT	IIa, IIb	Leg	40	20	20	VAC (125)	WD 1×/48–72h		Clinical			
Sibin	2017	India	RCT	IIa, IIb	Tibia	30	15	15	VAC (125)	WD		Clinical			

*Reported data including not exclusively Gustilo 3 types and fractures on the lower limb.
KCI, Kinetic Concepts, Inc; PS, prospective study; RS, retrospective study; VAC, vacuum-assisted closure; WD, wet dressing; WDD, wet-to-dry dressing; WMD, wet-to-moist dressing.

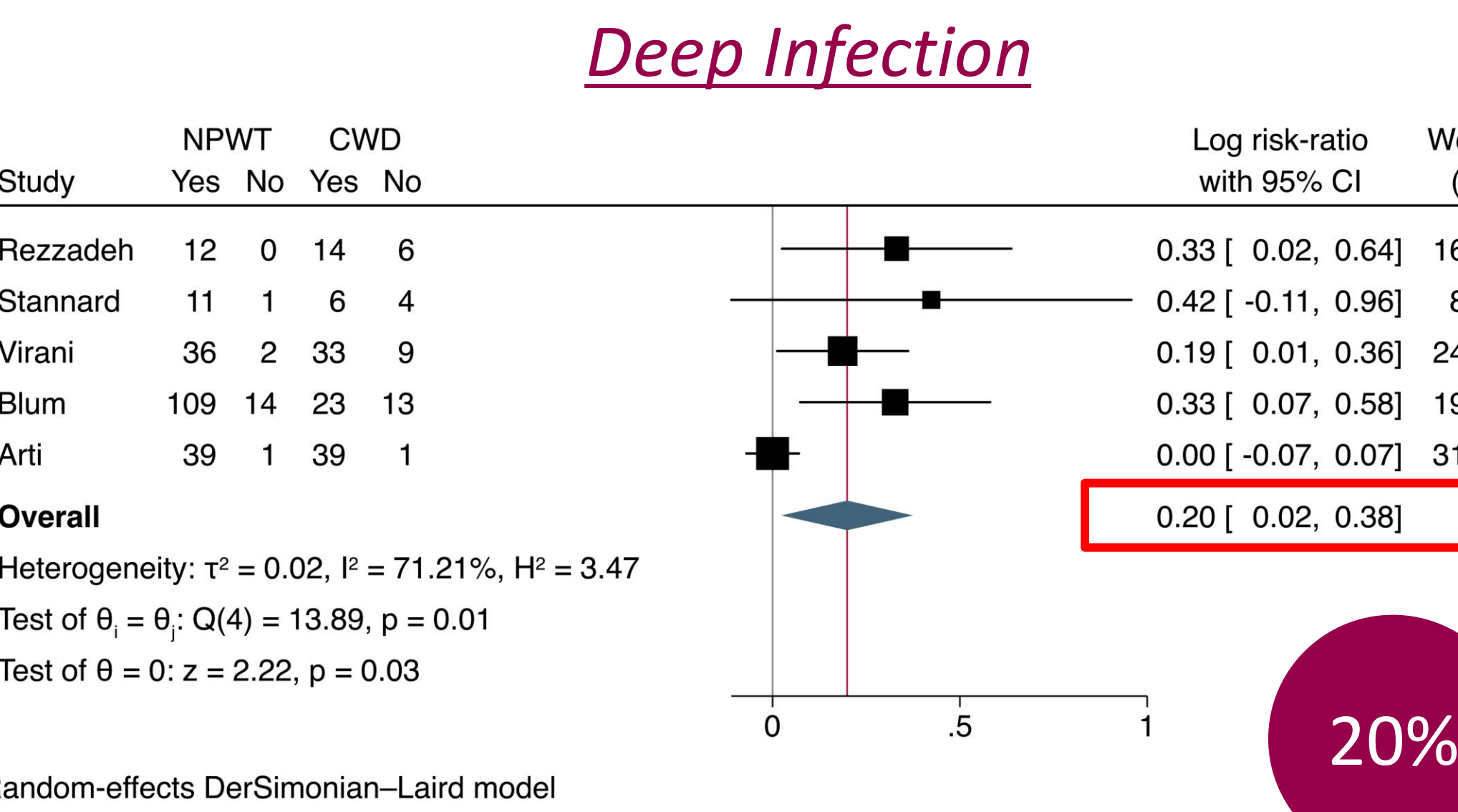
3a. Result



33%



35%



20%

3b. Results

Table 2. Pooled Effect for Overall Infections Using Subgroup Analyses

Subgroup Analyses	Studies (n)	RR (95% CI)	I ² (%)	P	RD (95% CI)	I ² (%)	P
RCT	5	0.29 (0.01–0.56)	67.45	0.04	0.26 (0.07–0.73)	74.77	0.01
>50 fractures	4	0.18 (0.04–0.32)	41.83	0.01	0.15 (0.05–0.26)	39.61	0.0046
3a, 3b, 3c	3	0.28 (0.13–0.43)	0.00	0.0004	0.22 (0.11–0.33)	0.00	0.0001
Tibia	6	0.35 (0.21–0.48)	16.90	0.0000	0.26 (0.17–0.35)	0.00	0.0000
Studies published before 2014	5	0.41 (0.17–0.65)	26.83	0.0008	0.31 (0.20–0.42)	14.89	0.0000
Studies published after 2014	4	0.23 (–0.02 to 0.48)	62.99	0.0661	0.19 (0.03–0.36)	60.90	0.0218

Overall infection rate

significantly higher in the CWD

group after analyzing only open

tibia fractures

35%

4. Conclusion

- **33%** higher rates of **overall infection** with CWD
- **35%** and **20%** higher rates of **superficial** and **deep infection** respectively with CWD
- **35%** higher rates of **overall infection** with CWD for Tibial fractures
- **NPWT** appears to be a **reasonable option** for wound management in **Gustilo 3 lower limb** fractures until final closure

