Meta-Analysis to Compare Outcomes of Two Different Negative Pressure Therapy Systems for Closed Incision Management in Knee and Hip Arthroplasty

Leah P. Griffin, MS[1]; John Cooper, MD[2]; Ronald Silverman, MD[1,3]

Background

- Closed incision negative pressure therapy (ciNPT) to aid in the reduction of incisional risks has been incorporated into the practice of diverse surgical specialties.[1-6]
- Commercially-available systems deliver ciNPT through a variety of different mechanisms.

Purpose

- The purpose of this meta-analysis is to compare potential effects of these differences on clinical outcomes following hip and knee arthroplasty.

Methods

- A systematic literature search (**Tables 1** and **2**) was conducted to identify hip and knee arthroplasty studies that compared the effect of two ciNPT systems against standard of care (SOC) on the incidence of surgical site complications (SSC) and surgical site infections (SSI).
- Meta-analyses were executed by calculating risk ratios (RR) using a random effects model to assess the effect of (1) closed incision negative pressure therapy with foam dressing (ciNPT-F*) versus SOC and (2) ciNPT with multilayer absorbent dressing (ciNPT-MLA†) versus SOC (**Table 3**).
- Comprehensive Meta-Analysis Version 3.0 (Biostat Inc., Englewood, NJ) software was used to perform the analyses.

Results (Cont'd)

- Twelve studies comparing ciNPT-F to SOC (**Table 1; Figures 1** and **3**) and 6 studies comparing ciNPT-MLA to SOC (**Table 2; Figures 2** and **4**) were identified.

Table 1. ciNPT-F Study Descriptives

Study	Study Design	Specific Wound Type
Anatone 2018	Retrospective	Primary TKA and THA
Cooper 2016	Retrospective	Revision TKA and THA
Curley 2018	Retrospective	TKA/UKA/UniPat
Doman 2021	Retrospective	Primary TKA
Higuera-Rueda 2020	RCT	Revision TKA
Manoharan 2016	Prospective	Primary TKA
Newman 2017	RCT	Revision THA and TKA
Pachowsky 2012	RCT	THA
Pauser 2016	RCT	Hemiarthroplasty for femoral neck fractures
Redfern 2017	Prospective With Historical Control	Primary THA and TKA
Tyagi 2019	Retrospective	Primary direct ANTERIOR approach THA
Tyagi 2020	Retrospective	Primary POSTERIOR approach THA

RCT: randomized controlled trial; THA: total hip arthroplasty; TKA: total knee arthroplasty; UKA: unicompartmental knee arthroplasty; UniPat: unicompartmental patellofemoral arthroplasty

Results (Cont'd)

Table 2. ciNPT-MLA Study Descriptives

Study	Study Design	Specific Wound Type
Giannini 2018	RCT	Revision hip and knee
Gillespie 2015	RCT	Primary THA
Helito 2020	Prospective With Historical Control	Primary TKA
Hester 2015	Retrospective	Revision KA and HA
Karlakki 2016	RCT	Primary TKA and THA
Keeney 2019	RCT	Primary or revision TKA and THA

RCT: randomized controlled trial; THA: total hip arthroplasty; TKA: total knee arthroplasty; HA: hip arthroplasty; KA: knee arthroplasty

Table 3. Summary of surgical site complication and surgical site infection meta-analyses

Outcome	Product	Studies (n)	RR (95% CI)	I^2	RRR (95% CI)	p-value
SSC	ciNPT-F	8	.332 (.236, .467)	0.000	67% (76%, 53%)	**< .001**
	ciNPT-MLA	5	.798 (.458, 1.390)	72.013	20% (54%, -39%)	.425
SSI	ciNPT-F	7	.401 (.190, .844)	0.000	60% (81%, 16%)	**.016**
	ciNPT-MLA	4	.580 (.222, 1.513)	16.725	42% (78%, -51%)	.265

SSC: surgical site complication; SSI: surgical site infection; RR: relative risk; CI: confidence interval; RRR: relative risk reduction

Conclusions

- In these meta-analyses, ciNPT-F demonstrated a statistically significant reduction in the incidence of SSCs and SSIs when assessed against SOC.
- Conversely, ciNPT-MLA did not demonstrate significantly different rates of SSCs and SSIs when compared to SOC.
- Reasons for these observed differences were not evaluated as part of this study.

References

1. Cooper HJ, Roc GC, Bas MA, et al. *Injury*. 2018;49(2):386-391.
2. Ruggieri VG, Olivier ME, Aludaat C, et al. *Heart Surg Forum*. 2019;22(2):E092-E096.
3. Licari L, Campanella S, Carolla C, Viola S, Salamone G. *Cureus*. 2020;12(5):e8283.
4. Swift SH, Zimmerman MB, Hardy-Fairbanks AJ. *J Reprod Med*. 2015;60(5-6):211-218.
5. Ferrando PM, Ala A, Bussone R, et al. *Plast Reconstr Surg Glob Open*. 2018;6(6):e1732.
6. Pleger SP, Nink N, Elzien M, et al. *Int Wound J*. 2018;15(1):75-83.

Results (Cont'd)

- For ciNPT-F, 8 of 12 studies reported SSC rates (**Figure 1**). In those, ciNPT-F significantly reduced the incidence of SSC (RR = .332, 95% CI = .236, .467; p < .001).
- For ciNPT-MLA, 5 of 6 studies reported SSC rates (**Figure 2**). In those, there was no significant difference in SSC rates between ciNPT-MLA or SOC (RR = .798, 95% CI = .458, 1.398; p = .425).

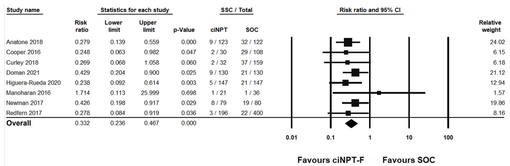

Figure 1. Surgical Site Complications (ciNPT-F versus SOC) forest plot.

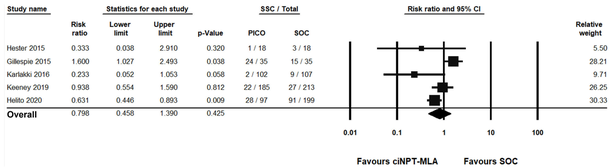

Figure 2. Surgical Site Complications (ciNPT-MLA versus SOC) forest plot.

Results (Cont'd)

- SSI rates were assessed in 7 of 12 studies involving ciNPT-F (**Figure 3**). In those, ciNPT-F significantly reduced the incidence of SSI (RR = .401, 95% CI = .190, .844; p = .016).
- For ciNPT-MLA, 4 of 6 studies reported SSI rates (**Figure 4**). In those, there was no significant difference in SSI rates between ciNPT-MLA or SOC (RR = .580, 95% CI = .222, 1.513; p = .265).

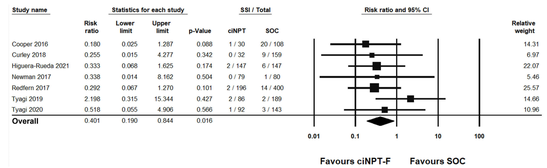

Figure 3. Surgical Site Infections (ciNPT-F versus SOC) forest plot.

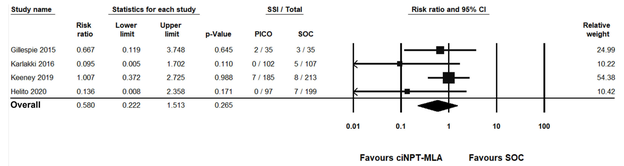

Figure 4. Surgical Site Infections (ciNPT-MLA versus SOC) forest plot.

Presented at Symposium on Advanced Wound Care Spring 2022| Wound Healing Society, Phoenix, AZ, April 6-10, 2022

NOTE: Specific indications, contraindications, warnings, precautions and safety information exist for these products and therapies. Please consult a clinician and product labeling prior to application. Rx only.

[1]3M, St. Paul, MN; [2]Columbia University Irving Medical Center, New York, NY; [3]University of Maryland School of Medicine, Baltimore, MD

*3M™ Prevena™ Incision Management System (3M Company; St. Paul, MN); †PICO° Single Use Negative Pressure Wound Therapy System (Smith+Nephew, Watford, England, UK)

The authors thanks 3M for assistance with poster preparation.