

Interposing bacterial filters in ventilator circuits or not?

B.S. Niël-Weise¹, P.J. van den Broek²

¹Dutch Infection Prevention Working Party, Leiden, The Netherlands

²Department of Infectious Diseases, Leiden University Medical Centre

Study population: mechanically ventilated ICU patients

Comparison: circuit without bacterial filter versus circuit with bacterial filter

Outcome: ventilator-associated pneumonia

Methods

Data sources

Publications were retrieved by a search of Medline and the Cochrane Library up to february 2006. Terms included were 'pneumonia' and 'ventilator*' and 'filter*'. To identify randomised controlled trials in Medline the following search strategy was used: (bacterial filter* OR filter* OR Equipment Contamination/prevention & control* OR Filtration/instrumentation*) AND ((ventilator associated pneumonia) OR (VAP AND (pneumonia OR pneum*)) OR ("Respiration, Artificial"[MAJR] AND pneumonia) OR (ventilated AND pneumonia) OR (ventilation AND pneumonia)) AND (((randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[mh] OR random allocation[mh] OR double-blind method[mh] OR single-blind method[mh] OR clinical trial[pt] OR clinical trials[mh] OR ("clinical trial"[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR ("latin square"[tw]) OR placebos[mh] OR placebo*[tw] OR random*[tw] OR research design[mh:noexp] OR comparative study[mh] OR evaluation studies[mh] OR follow-up studies[mh] OR prospective studies[mh] OR cross-over studies[mh] OR control*[tw] OR prospective*[tw] OR volunteer*[tw]) NOT (animal[mh] NOT human[mh])))). Additionally, all reference lists of identified trials were examined.

Selection criteria

All randomised and quasi-randomised trials comparing ventilator circuits with bacterial filters with ventilator circuits without bacterial filters and ventilator-associated pneumonia as the outcome measure.

Review methods

Data were extracted by two reviewers independently and compared. Disagreements were resolved by discussion. Data from the original publications were used to calculate the relative risk of ventilator-associated pneumonia. Data for similar outcomes were combined in the analysis where appropriate, using a random-effects model.

Results

One parallel-group randomised controlled trial was included (1).

Study population, interventions and outcome definitions

See Table I

Validity assessment

See Table II

Summary estimates of associations between treatment and control group

See Figure I

Table I: Study population, interventions and outcome definitions

	Participants	Interventions	Definition of ventilator associated pneumonia (VAP)
Lorente et al. 2003	<p>Incl: medicosurgical ICU patients, ventilated > 24 hrs</p> <p>Excl: not reported</p> <p>Mean number of ventilation days (SD): T: 14.84 (17.65); C: 13.68 (14.92)</p>	<p>Treatment (116 analyzed): no bacterial filter</p> <p>Control (114 analyzed): bacterial filter: one in the inhalation branch right after the exit of the circuit and one in the exhalation branch right before the entrance of the respiratory circuit; filters changed every 48 hours</p> <p>Notes: 1) Sterivent (Mallinckrodt, Hazelwood, MO); 2) humidification by a heat and moisture exchanger in both groups</p>	<p>VAP was defined as new onset of purulent sputum and T > 38° C or < 35.5° C and WBC > 10⁴ mmm³ or < 4x10³ mm³ and new or progressive infiltrate and positive cultures of EBS > 10⁶ CFU/ml or BAL > 10⁴ CFU/ml or PSB > 10³ CFU/ml or same organism found in blood culture than in bronchial secretion, which was quantitatively not significant.</p>

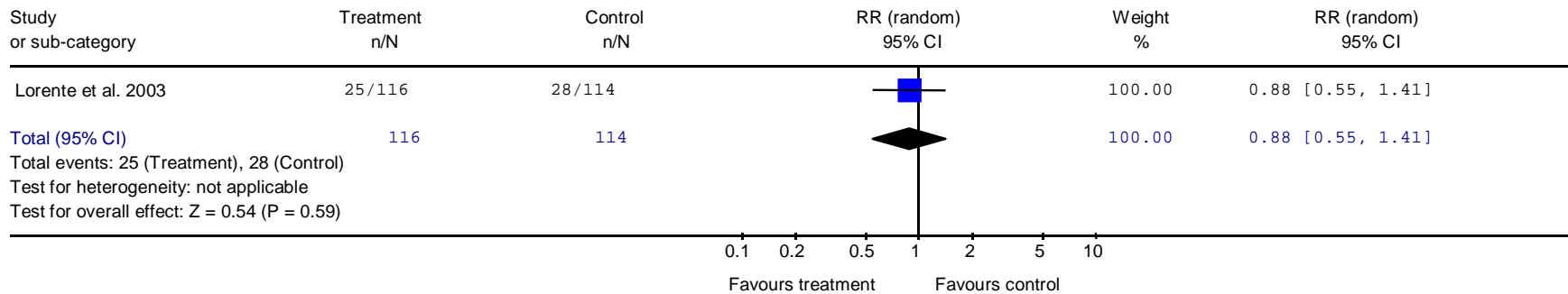
	End of the study protocol: not reported	
--	---	--

Table II: Data on quality assessment

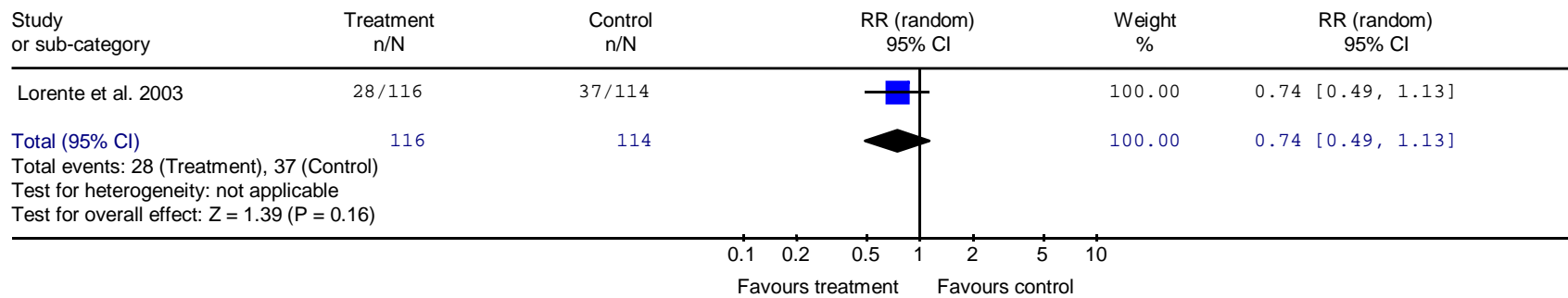
Lorente et al. 2003	<i>Generation of allocation sequence:</i> <i>Concealment of allocation:</i> <i>Blinding attending physician:</i> <i>Blinding outcome assessors:</i> <i>Description of dropouts:</i> <i>Analysis by intention-to-treat:</i>	Randomization by a random number generated from Excel software Unclear No No No Unclear
----------------------------	---	--

Figure I: Summary estimates of associations between treatment and control group expressed as relative risk (RR) and 95% confidence interval (CI) using a random effects model

Review: VAP - Circuits with bacterial filters
 Comparison: Respiratory circuits without bacterial filters vs with bacterial filters
 Outcome: 01 At least one episode of ventilator-associated pneumonia



Review: VAP - Circuits with bacterial filters
 Comparison: Respiratory circuits without bacterial filters vs with bacterial filters
 Outcome: 02 Mortality



Conclusion

The evidence available whether circuit without bacterial filter versus circuit with bacterial filter should be used to prevent ventilator-associated pneumonia, is not sufficient as a basis for determining practice. Only a single trial with a small sample size and unclear methodology investigated this issue.

References

1. Lorente L, Lecuona M, Málaga J, Revert C, Mora ML, Sierra A. Bacterial filters in respiratory circuits: An unnecessary cost? Crit Care Med 2003;31(8):2126-2130.