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## Systematic Review

# Interest of pharyngeal packing in head and neck surgery: a meta-analysis

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**Keywords:** Pharyngeal packing / head and neck surgery / meta-analysis

**Abstract – Introduction:** There is controversy regarding the use of pharyngeal packing in oral and nasal surgery. The primary objective of this study was to examine the association between pharyngeal packing, throat pain, and postoperative nausea and vomiting (PONV) in head and neck surgery. **Material and methods:** A systematic review of clinical studies published from January 2000 to August 2020 concerning the use of pharyngeal packing in head and neck surgery was conducted in the Medline, ScienceDirect and Cochrane Library databases. Throat pain and PONV were collected in each article, and a meta-analysis was performed. **Results:** A total of 10 clinical trials involving 877 patients were included in the meta-analysis. Pharyngeal packing did not significantly decrease PONV score either during the immediate (OR = 0.90, 95% CI: 0.59 to 1.38, $p = 0.52$, $I^2 = 0\%$) or the delayed postoperative period (OR = 0.88, 95% CI: 0.54 to 1.43, $p = 0.28$, $I^2 = 21\%$), but significantly increased the immediate postoperative throat pain score (MD = 0.68, 95% CI: 0.21 to 1.16, $p = 0.19$, $I^2 = 35\%$). **Conclusion:** This study suggests that the use of a pharyngeal packing to improve the preoperative aftermath in head and neck surgery should not be recommended.

## Introduction

Many head and neck surgery procedures are performed under general anesthesia (GA). While GA makes the most delicate operations possible, it is also the cause of complications.

Postoperative Nausea and Vomiting (PONV) is defined as nausea and/or vomiting occurring during the first two days after surgery [1]. Its reported incidence usually varies between 20% and 30%, and can reach 80% in high-risk patients [2]. Four main risk factors have been identified: female gender, non-smoking, history of nausea or vomiting, and use of opioids during or after surgery [3]. Other factors influence PONV, such as the duration of surgery, or electrolyte imbalance due to significant blood loss. PONV can lead to certain adverse consequences such as significant postoperative morbidity, high costs associated with prolonged hospital stays and inappropriate medication use, and patient dissatisfaction. Oral surgery itself is also a risk factor for PONV. The maxillofacial region is a highly vascularized area, and procedures involving this region can cause significant bleeding, which may increase the incidence of PONV due to intra- and postoperative blood ingestion [4]. Coughing, as a consequence of these inhalations, increases the local bleeding and can thus initiate a vicious circle.

Compared to orotracheal intubation, nasotracheal intubation has become the most common technique in oral surgery, due to its convenience. The specific problems of anesthesia in oral, nasal and maxillofacial surgery are dominated by the maintenance of upper airway patency during the procedure. This takes into account the foreseeable difficulties of intubation, surgical constraints and the status of the airway in the postoperative period [5]. Protection of the upper airways from bleeding is most often provided by tracheal intubation. The cuff of the intubation tube only protects the airways from inhalation during the procedure. The packing, in addition, makes it possible to avoid any risk of ingestion which could favor PONV [6]. There are several different types of packing, mostly in the form of woven compresses (knotted or not) and polyurethane foam packing (Fig. 1).

Blood has emetogenic properties, so it is assumed that the presence of a pharyngeal packing reduces the incidence of PONV, by decreasing the amount of blood ingested during a procedure [7]. However, in 2009, Jaiswal *et al.* performed a systematic review on the use of pharyngeal packing in nasal surgery, evaluating four randomized controlled trials, without being able to conclude on the efficacy of packing [8]. Since then, several prospective, randomized, controlled and double-blind

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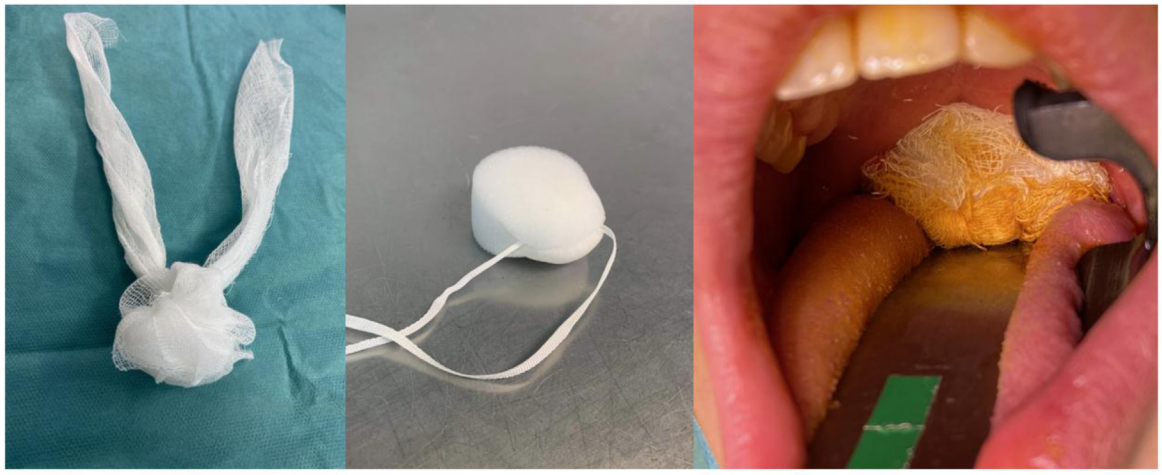


**Fig. 1.** Example of different pharyngeal packings in (a) knotted woven compress (b) polyurethane foam packing with recall threads (c) packing (woven compress) in mouth.

studies have been published in the literature. It should also be noted that pharyngeal packing is not without complications. Studies have shown that pharyngeal packing can increase postoperative throat pain [9,10], cause aphthous stomatitis [11], pharyngeal plexus lesions [12], or significant tongue edema [13]. Finally, failure or forgetting to remove the packing after the procedure is a rare but potentially very serious complication, which can cause airway obstruction after extubation [14,15].

The conflicting results of studies, the resulting controversy, and the great variability in the use of pharyngeal packing in oral and nasal surgery among the surgical teams led us to conduct this work. It consists of a meta-analysis of clinical trials to examine the association between pharyngeal packing, throat pain, and PONV in head and neck surgery.

## Material and methods

### Literature search strategy

This meta-analysis was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines [16]. Medline, ScienceDirect, and Cochrane Library were searched from July to October 2020. We used and combined the following search terms. For the study population the terms "Surgery, Oral" [Mesh]; "Dentistry" [Mesh]: "Otorhinolaryngologic Surgical Procedures [Mesh]"; "Orthognathic Surgery" [Mesh] were used. For the treatment evaluated we chose the terms "Pads, Surgical" [Mesh] and "pharyngeal packing". For treatment response the following terms were searched: "Pharyngitis" [Mesh]; "Respiratory Distress Syndrome, Adult" [Mesh]; "Postoperative Nausea and Vomiting" [Mesh]. Table I summarizes the search equations and the number of corresponding results.

### Inclusion and exclusion criteria

Clinical studies published from January 2000 to August 2020, in English, concerning the use of pharyngeal packing in head and neck surgery and investigating throat pain or PONV, in ASA (American Society of Anesthesiologists) I or II patients eligible for general anesthesia for oral or nasal surgery were included. Texts had to be available in full.

Clinical studies of low quality (modified Jadad scale score less than 4) were excluded [17,18]. Studies in which data were ambiguous, incomplete, or could not be merged were also excluded from the meta-analysis.

### Assessment of methodological quality

Quality assessment of the selected prospective studies was performed according to PRISMA criteria and using the modified Jadad scale. The assessment of risk of bias included:
- Randomization and whether it was appropriate.
- Double-blinding and whether it was appropriate.
- Excluded patients were reported by number and cause of exclusion.
- Method(s) used to assess adverse events were described.
- The method(s) of statistical analysis was (were) described.
- Inclusion and/or exclusion criteria were reported.

Of the 12 questions used to obtain the modified Jadad score, eight were quantified by values: a "yes" corresponded to one point (+1) and a "no" to 0 or a negative point (–1). Five questions were not quantified. Quality was therefore rated from 0 to 8 points. Detailed information is available in Table II.

The ranking was done in four categories as follows:
- Low level studies (low validity): 0 to 1 point.
- Poor studies: 2 and 3 points.

**Table I.** Search equations and their corresponding results.

| Research equations | Medline | Cochrane library | Science Direct |
|---|---|---|---|
| « Tampons, Surgical » [Mesh] AND (« Pharyngitis » [Mesh] OR « Postoperative Nausea and Vomiting » [Mesh]) | 14 | 5998 | x |
| « Tampons, Surgical » [Mesh] AND (« Surgery, Oral » [Mesh] OR « Dentistry » [Mesh] OR « Otorhinolaryngologic Surgical Procedures » [Mesh]) | 163 | 923 | x |
| « Postoperative Nausea and Vomiting » [Mesh] AND (« Surgery, Oral » [Mesh] OR « Orthognathic Surgery » [Mesh] OR « Otorhinolaryngologic Surgical Procedures » [Mesh] OR « Dentistry » [Mesh]) | 330 | 4838 | x |
| « Respiratory Distress Syndrome, Adult » [Mesh] AND (« Surgery, Oral » [Mesh] OR « Dentistry » [Mesh] OR « Otorhinolaryngologic Surgical Procedures » [Mesh]) | 162 | 2483 | x |
| « pharyngeal packing » AND (« Surgery, Oral » [Mesh] OR « Dentistry » [Mesh] OR « Otorhinolaryngologic Surgical Procedures » [Mesh]) | x | 1126 | x |
| « pharyngeal packing » AND (« postoperative nausea and vomiting » [Mesh] OR « Pharyngitis » [Mesh]) | x | 5897 | x |
| « pharyngeal packing » | x | x | 1893 |
| « THROAT PACK » | x | x | 7813 |

x = search not feasible.

**Table II.** Modified Jadad scale.

| Criteria | Yes | No | Not described/unclear |
|---|---|---|---|
| Q1. Is this a randomized controlled trial? | Continued | Stop | |
| Q2. The study is reported as a randomized trial | +1 | 0 | |
| Q3. Randomization is appropriate | +1 | –1 | |
| Q4. The study is reported as double-blind | +1 | 0 | |
| Q5. Double-blinding is appropriate | +1 | –1 | |
| Q6. Excluded patients are reported by number and reason | +1 | 0 | |
| 7. Jadad scale out of 5 | | | |
| Q8. The method(s) used to assess adverse events is described | +1 | 0 | |
| Q9. The method(s) of statistical analysis is described | +1 | 0 | |
| Q10. Inclusion and/or exclusion criteria are reported | +1 | 0 | |
| 11. Modified Jadad scale out of 11 | | | |
| Q12. Was the randomization sufficiently concealed? | | | |
| Q13. Was the analysis based on the intention-to-treat (ITT) principle? | | | |
| Q14. Was the sample size justified? | | | |

– Good studies: 4 and 5 points.
– Strong studies (high validity): 6, 7 and 8 points.

### Endpoints and assessment tools

Given the clinical relevance of assessing both throat pain and PONV, there were two primary endpoints. There were no secondary endpoints. The measurement of the endpoints was based on reliable tools such as the Visual Analog Scale (VAS) for throat pain [19]. The Korttila (20) [20], Wengritzky [21], Weilbach [22], presence or absence (the "yes/no" scale), and VAS scales were used to determine PONV. Descriptions of these rating scales can be found in Tables III–V. Assessment of PONV and postoperative throat pain was collected between 30 min and 4 h after surgery (immediate postoperative) and then at 24 h after surgery (delayed postoperative). If a study evaluated a judgment criterion several times during the immediate postoperative period (example: throat pain was evaluated at 1, 2 and 4 h postoperatively), the value "2 hours" was preferred. Indeed, this value was mostly used in the included trials.

**Table III.** Korttila scale (PONV).

| Criteria | PONV stage |
|---|---|
| Absence of any emetic episodes and nausea | Absence |
| 1) Patient has had only mild nausea<br>2) An emetic episode or nausea of short duration (10min), regardless of severity, occurred but was triggered by an exogenous stimulus (*e.g*, drinking, eating, or moving). After this event, nausea decreased and the patient felt well during the postoperative observation period. No antiemetic medication was required | Mild |
| 1) Patient had one or two emetic episodes or moderate to severe nausea without exogenous stimuli.<br>2) Patient required antiemetic treatment once | Moderate |
| The patient has had more than two episodes of emesis or nausea (moderate or severe). Administration of at least one antiemetic medication was required. | Severe |

**Table IV.** Weilbach scale (PONV).

| Criteria | PONV score |
|---|---|
| No PONV | 0 |
| Mild nausea | 1 |
| Moderate nausea | 2 |
| Severe nausea and/or mild vomiting | 3 |
| Continuous vomiting | 4 |

### Data extraction

The studies were reviewed independently by two reviewers (PhD student + assistant), and any disagreement was resolved by discussion between them. They first reviewed the titles and abstracts of the included trials. If both reviewers excluded an essay, it was removed from further consideration. If there was not enough information to make a decision based on the title and abstract, the full article was obtained for full review. The full-text articles were reviewed by both reviewers on the basis of the inclusion criteria.

The data were then extracted using a predefined table. The following information was recorded: first author, year of publication, country, outcome criteria, sample size, age, study design, packing use for the control group, outcome measures, rating scales, and major study bias. The two reviewers extracted the data separately, and any disagreement was resolved by discussion between the two reviewers.

### Data synthesis and analysis

The meta-analysis was performed using R software (version 4.0). PONV and throat pain were the primary endpoints. There were no secondary endpoints. The Odds Ratio (OR) was used to compare the risk of PONV (qualitative variable). The Mean Difference (MD) was used to compare throat pain (quantitative variable). We considered that on a VAS scale of 0 to 10, a mean score difference of 1 was relevant.

Kendall's tau (2), and I-squared ($I^2$) statistical tests were used to assess the heterogeneity of the results. An $I^2$ value of less than 25% represents insignificant heterogeneity, between 25% and 50% low heterogeneity, between 50 and 75% moderate heterogeneity, and greater than 75% high heterogeneity [23]. When the p-value was less than 0.05 and $I^2$ greater than 50%, the result was recognized as heterogeneous. The random-effects model was then used for statistical analysis. When this was not the case ($p$-value greater than 0.05 or $I^2$ less than 50%) the analysis was performed using a fixed effect model.

Funnel plots were created and examined for signs of skewness to investigate publication bias. A power analysis was performed post-hoc.

## Results

### Selection of studies

A total of 12 articles were retrieved from the Medline database, 27 from the Cochrane Library and 4 from ScienceDirect. After removing duplicates, 31 studies remained to be analyzed. Five of these were not fully available online and were therefore excluded [24–28]. A total of 26 studies were initially included. The full texts of these remaining 26 articles were analyzed and 12 trials were excluded, for the following reasons:

- Low methodological quality, with a modified Jadad score of less than 4 ($n = 4$) [10,29–31].
- Ongoing study with results not yet published ($n = 8$) [32–39].

A total of 14 studies were included in the qualitative synthesis. Of these 14 studies, 4 had non-actionable results [4,11,40,41].

Therefore, ten studies were included in the meta-analysis (quantitative synthesis): [7,9,42–49]. The flow diagram, based on PRISMA criteria, is shown in Figure 2.

**Table V.** Wengritzky scale (PONV).

| Evaluation | Score |
|---|---|
| **Q1.** Did you vomit or feel nauseous? | |
| a) No | 0 |
| b) Once or twice | 2 |
| c) Three or more times | 50 |
| **Q2.** Have you experienced a feeling of nausea ("a feeling of unsteadiness in the stomach and a slight urge to vomit")? If yes, did your feeling of nausea interfere with activities of daily living, such as being able to get out of bed, being able to move around in bed, being able to walk normally, or eating and drinking? | |
| a) No | 0 |
| b) Sometimes | 1 |
| c) Often or most of the time | 2 |
| d) All the time | 25 |
| **Q3.** Has your nausea been mostly: | |
| a) Variable ("comes and goes")? | 1 |
| b) Constant ("always or almost always present")? | 2 |
| **Q4**. How long did your nausea last (in hours [whole or split])? | .....,.....h |
| For this questionnaire, if the answer to Q1 = c), the questionnaire score = 50. Otherwise, select the higher score of Q1 or Q2, then multiply x Q3 x Q4 | PONV intensity score |

### Characteristics of the included studies

A total of 10 trials involving 877 patients were thus included in our meta-analysis. 100% of the included patients were recruited at the hospital. The largest sample size was 144 participants [7], and the smallest sample size was 41 participants [44]. Clinical trial quality was assessed with a mean modified Jadad score of 6.4/8.

The main characteristics of the 10 included trials are listed in Table VI. Of these ten studies, five (50%) were conducted in Asia, three (30%) in the Americas, and two (20%) in Europe. The year of publication ranged from 2006 to 2019.

Of the 10 included studies, 8 evaluated postoperative PONV and throat pain; one evaluated only PONV; and one evaluated PONV and postoperative total stomach volume. Similarly, 9 of the 10 studies involved sinus-nasal surgery, and only one involved oral surgery.

The method of assessment of PONV was the Korttila scale for 5 of the 10 studies; the presence or absence of PONV (the "yes/no" scale) for 3 studies; the Wengritzky scale for one study; and finally the VAS from 0 to 10 for one study as well. The method of assessing postoperative throat pain was VAS (0 to 10) for 7 of 8 studies and the presence or absence of throat pain ("yes/no") for one study.

All studies controlled for possible confounding factors such as patient age, gender and ASA score, duration and type of procedure (septorhinoplasty, septoplasty, endoscopic sinus surgery, minor oral surgery, orthognathic surgery, *etc.*), Cormack-Lehane score at intubation, amount of blood ingested and postoperative opioid use.

6 studies prescribed postoperative antiemetics routinely for every patient (Ondansetron for [9,42,44,48], Metoclopramide for [47]). 4 studies specified that they did not give antiemetics in order not to interfere with the development of PONV [7,43,45,49].

Of the 10 included trials, 8 compared a treatment group "pharyngeal packing = PP" versus a control group "no packing = NP". One study compared a "PP" group versus a "nasopharyngeal packing = NPP" group [44]. In this case nasopharyngeal packing was equated with no packing for the calculation of postoperative throat pain, but the PONV results of this study were not considered in the meta-analysis (likely decrease in intraoperative blood ingestion). One study (48) compared three treatments groups: "dry packing" "wet packing" and "GCCB (Chlorhexidine Gluconate and Benzydamine Hydrochloride) soaked packing" versus a "NP" control group [47]. The "dry packing" and "wet packing" groups were combined into a single "PP" group.

Finally, Table VII shows the postoperative assessment times at which the endpoints (PONV and throat pain) were recorded. Of the 10 trials, 6 recorded data at both 2 h and 24 h postoperatively. Only one study did not record data in the immediate postoperative period (between 30 min and 4 h) [7]. Similarly, 2 studies did not record data in delayed postoperative (24 h) [45,47].

Within 2 included trials some data were missing: the results concerning throat pain were not usable. But the data regarding PONV were complete and could therefore be analyzed [7,47].

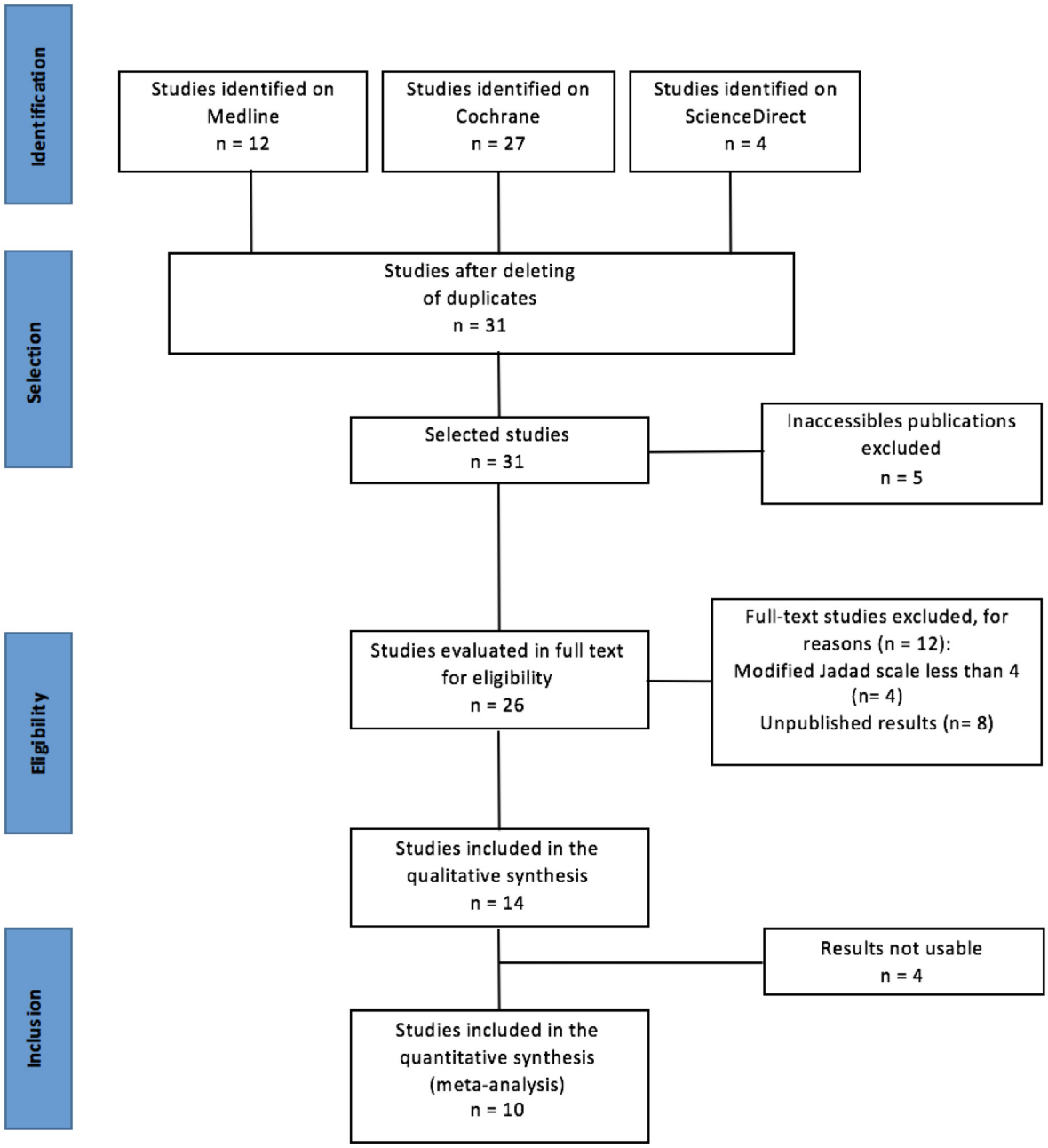


**Fig. 2.** Flow chart, based on PRISMA criteria.

## Results of the meta-analysis

### Meta-analysis of pharyngeal packing on PONV

Considering the presence or absence of PONV (the "yes/no" scale), 9 studies involving 783 patients, were selected to examine the effect of pharyngeal packing on PONV [7,9,42–44,46–49].

The fixed-effect model meta-analysis showed that pharyngeal packing did not significantly decrease the PONV score of patients in the treatment group compared with the control group, either in the immediate postoperative period (OR = 0.90, 95% CI: 0.59 to 1.38, $p = 0.52$, $I^2 = 0\%$) or the delayed postoperative period (OR = 0.88, 95% CI: 0.54 to 1.43, $p = 0.28$, $I^2 = 21\%$). Detailed information is presented in Figures 3 and 4.

### Meta-analysis of pharyngeal packing on postoperative throat pain

5 studies involving 310 patients were selected to examine the effect of pharyngeal packing on postoperative throat pain [9,42,44–46].

**Table VI.** Characteristics and quality of the included trials.

| Study | Country | Study model | Sample origin | Sample size | Temoin group | Control group | **Variables Studied** (scale) | Main bias | Modified JADAD scale |
|---|---|---|---|---|---|---|---|---|---|
| Faro *et al.* 2019 | Brazil | RCT | Hospital | 50 | PP *n* = 25 | AP *n* = 25 | PONV (Korttila)<br>Pain (VAS)<br>Dysphagia | –Selection (not ITT analysis) | 8 |
| Temel *et al.* 2019 | Turkey | RCT | Hospital | 88 | PP *n* = 44 | AP *n* = 44 | PONV (Korttila)<br>Total volume stomach | –Selection (not ITT analysis)<br>–Classification (non-standardized evaluation procedure) | 5 |
| Alfiky *et al.* 2018 | Saudi Arabia | RCT | Hospital | 41 | PP *n* = 23 | NPP *n* = 18 | PONV (yes/no)<br>Pain (VAS) | –Selection (not ITT analysis)<br>–Confusion (no control group without PP) | 8 |
| Al-lami *et al.* 2017 | England | RCT | Hospital | 80 | PP *n* = 40 | AP *n* = 40 | PONV (Wengritzky)<br>Pain (VAS) | –Selection (not ITT analysis) | 6 |
| Green *et al.* 2017 | United States | RCT | Hospital | 42 | PP *n* = 20 | AP *n* = 22 | PONV (Korttila)<br>Pain (VAS) | –Selection (not ITT analysis) | 8 |
| Meco *et al.* 2016 | Turkey | RCT | Hospital | 201 | PP *n* = 52<br>Wet PP *n* = 48<br>PP soaked in CGBH *n* = 51 | AP *n* = 50 | PONV (Korttila)<br>Pain (VAS) | –Selection (not ITT analysis) | 8 |
| Razavi *et al.* 2015 | Northern Ireland | RCT | Hospital | 89 | PP *n* = 44 | AP *n* = 45 | PONV (yes/no)<br>Pain (VAS) | –Selection (not ITT analysis)<br>–Classification (non-standardized evaluation procedure) | 4 |
| Korkut *et al.* 2010 | Turkey | RCT | Hospital | 100 | PP *n* = 50 | AP *n* = 50 | PONV (Korttila) | –Selection (not ITT analysis) | 6 |
| Piltcher *et al.* 2007 | Brazil | RCT | Hospital | 144 | PP *n* = 70 | AP *n* = 74 | PONV (yes/no)<br>Pain (yes/no) | –Classification (no intra-individual comparison) | 5 |
| Basha *et al.* 2006 | Northern Ireland | RCT | Hospital | 93 | PP *n* = 45 | AP *n* = 48 | PONV (VAS 0 to 10)<br>Pain (VAS) | –Selection (not ITT analysis) | 6 |

RCT: Randomized Controlled Trial; PP: Pharyngeal Packing; CGBH: Chlorhexidine Gluconate and Benzydamine Hydrochloride; NPP: Nasopharyngeal Packing; AP: Absence of Packing; VAS: Visual Analog Scale; ITT: Intention-to-Treat analysis.

**Table VII.** The different evaluation times of the trials include.

| Studies | Wake up | 5 min | 10 min | 30 min | 1 h | 2 h | 4 h | 6 h | 8 h | 12 h | 24 h | 1 week |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Faro *et al.* 2019 | | | | | | o | | | | | o | |
| Temel *et al.* 2019 | | | | | | o | o | | o | | o | |
| Vural *et al.* 2019 | | | | | o | o | o | o | | o | o | |
| Alfiky *et al.* 2018 | | | | | | o | | | | | o | o |
| Al-lami *et al.* 2017 | o | | | | | o | | o | | | | |
| Green *et al.* 2017 | | | | | | | o | | | | o | |
| Meco *et al.* 2016 | | o | o | o | | | | | | | | |
| Razavi *et al.* 2015 | | | | | | o | | o | | | o | |
| Korkut *et al.* 2010 | | | | | | o | o | | o | | o | |
| Piltcher *et al.* 2007 | | | | | | | | | | | o | |
| Basha *et al.* 2006 | | | | | | o | | o | | | o | |

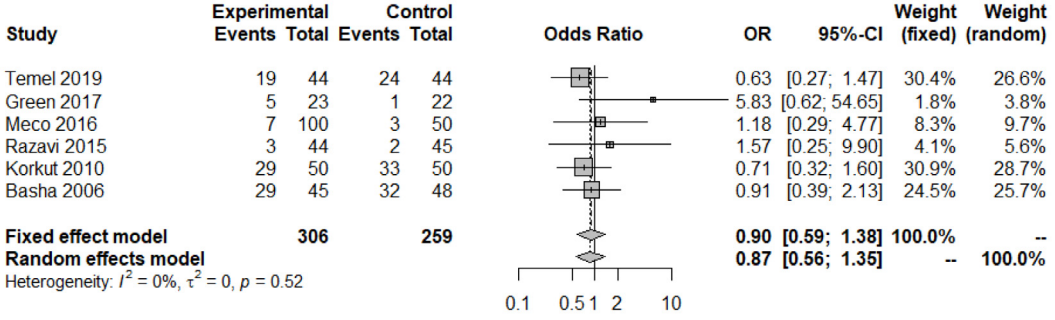


**Fig. 3.** Forest plot of PONV in immediate postoperative period.

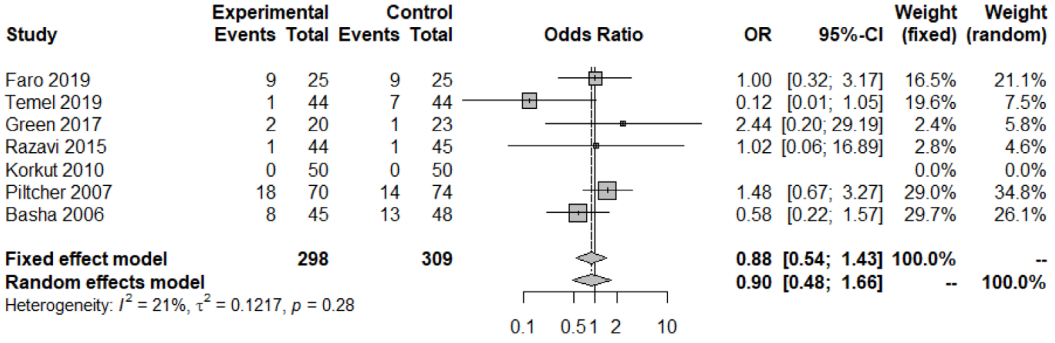


**Fig. 4.** Forest plot of PONV in delayed postoperative period.

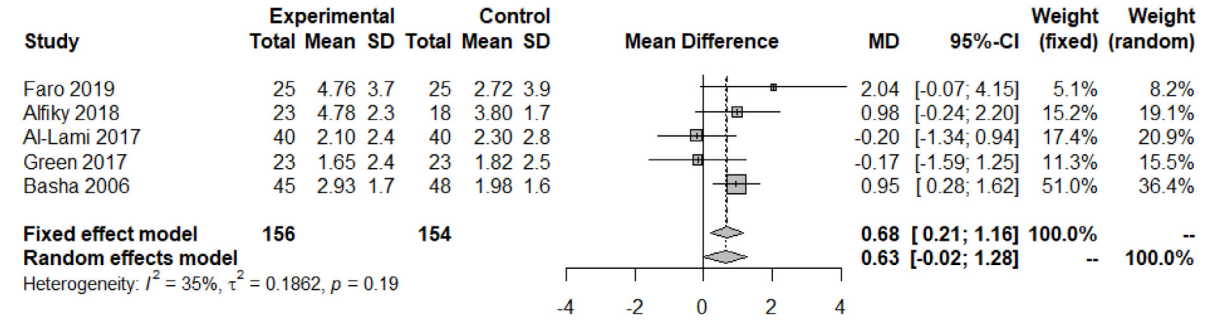


**Fig. 5.** Forest plot of throat pain in immediate postoperative period.

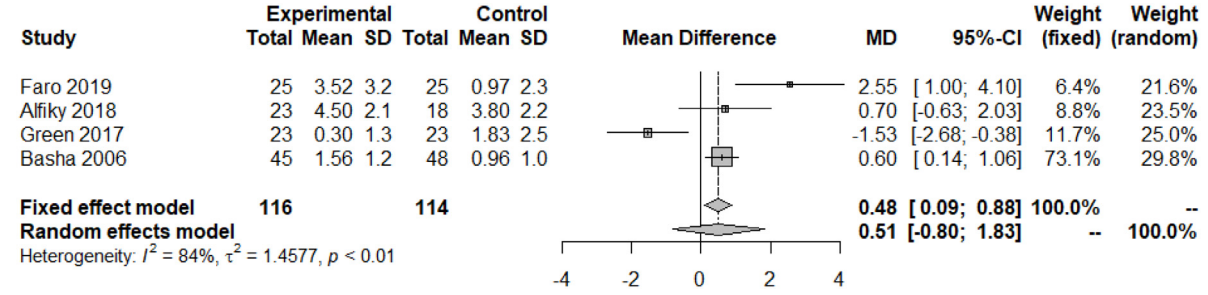


**Fig. 6.** Forest plot of throat pain in delayed postoperative period.

The fixed-effect model meta-analysis showed that pharyngeal packing significantly increased the throat pain score in immediate postoperative (MD = 0.68, 95% CI: 0.21 to 1.16, $p = 0.19$, $I^2 = 35\%$).

In delayed postoperative, heterogeneity was significant ($p < 0.01$), so the fixed model was not usable. Meta-analysis of the random-effect model failed to show a significant effect (MD = 0.51, 95% CI: −0.80 to 1.83, $p < 0.01$, $I^2 = 84\%$). Detailed information is presented in Figures 5 and 6.

### Assessment of publication bias and sensitivity analysis

The meta-analysis plots for PONV and immediate postoperative pain are relatively symmetric. In contrast, the meta-analysis plot for delayed postoperative pain is asymmetric, suggesting the presence of publication bias.

Sensitivity analyses were not performed because of the small number of trials included in the analyses.

## Discussion

To our knowledge, this study is the first meta-analysis evaluating the association between pharyngeal packing, throat pain, and PONV in patients undergoing general anesthesia for head and neck surgery. As a comprehensive study (three databases were searched) this study appears to have some strengths. The analysis of 10 prospective studies included 877 participants and provided sufficient statistical power to address the controversies associated with the use of pharyngeal packing in head and neck surgery. All available prospective studies with minimal selection bias were included in this meta-analysis. Finally, the heterogeneity of the studies was relatively low, minimizing the risk of publication bias. Several limitations in this study should however be mentioned. There were some differences in the means of assessment of PONV and throat pain between the included studies. Uncontrolled or unmeasured variables (such as time to intervention, amount of blood ingested, opioid use) may lead to residual confounding. We were unable to perform subgroup analysis on these confounders. Finally, there is a publication bias inherent to all meta-analyses.

Currently, there is no consensus nor clear recommendations on the use of pharyngeal packing in head and neck surgery. As for the responsibility for its implementation and, above all, its withdrawal, the literature is even more unclear. In 2007, a questionnaire sent to oral and maxillofacial surgeons and anaesthetists in the United Kingdom (176 complete responses received) to evaluate the practice around pharyngeal packing confirmed this great variability [15]. Indeed, 39% of the practitioners systematically applied a packing during oral surgery and 52% occasionally. The answers concerning the person responsible for the application of the packing and its removal were also discordant.

The main reason usually put forward to justify the use of a pharyngeal packing before oral or nasal surgery is to minimize the ingestion of blood or foreign bodies during the procedures. By completing the sealing of the upper airway, already ensured by the intubation tube and the inflation of the balloon, the pharyngeal packing should thus reduce PONV. However, the results of this meta-analyse showed that pharyngeal packing did not significantly reduce PONV, either in the immediate or delayed postoperative period. These results are consistent with those found in the literature and confirm that pharyngeal packing is not a 100% effective physical barrier [7,45,49]. Laureano Filho *et al.* described the inhalation of an orthodontic bracket during orthognathic surgery, although a pharyngeal packing was in place [50]. But the study by Temel *et al.* 2019 is not in agreement with the present results [43]. They indeed observed that the increase in stomach diameter and volume was significantly greater in patients who did not have packing during surgery, suggesting greater blood ingestion, in comparison with patients who had pharyngeal packing. However, this study had several biases giving it a low level of evidence. Many other factors (gender, non-smoking, use of opioids, duration of surgery, electrolyte imbalance) may be more important than the amount of blood ingested, and explain the lack of significant difference in studies that have investigated PONV in patients operated with and without pharyngeal packing. The results of this meta-analysis also showed that pharyngeal packing significantly increased pain in the immediate postoperative period. This rise in throat pain can be explained by the additional pressure that the packing exerts in the pharyngeal region (in addition to insertion of the intubation probe through the glottis), thus decreasing the local perfusion of the pharyngeal mucosa and increasing the inflammatory response of the region. Another advantage of not using a packing is to avoid aphtous lesions [11]. Some techniques of PP insertion are also more traumatic than others, and may increase lingual pressure and impair venous drainage of the tongue resulting in painful edema, particularly in patients with small oral cavities.

There is therefore a morbidity associated with pharyngeal packing. In the questionnaire cited above, 22% of the respondents said they had been aware of incidents of retention of pharyngeal packing [15]. Indeed, several cases of retention are described in the literature [51], as well as a case of engorged and cyanotic tongue following the application of the packing [52]. According to these reports, should the surgeon and anesthesiologist decide to use pharyngeal packing, a specific protocol for bucco-pharyngeal packing should be well established and known to all within the operating theatre team. A technical note was published in 2012 on this topic [53].

The results of this meta-analyse, show that the use of pharyngeal packing does not reduce PONV in head and neck surgery, and significantly increases throat pain during the first hours after surgery. In addition, considering the potential vital risk of forgetting it in the throat when removing the probe after surgery, it appears that the routine use of pharyngeal packing in head and neck surgery should not be recommended.

## Conflict of interest

The authors have no conflicts of interest to declare.

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## Informed consent

This study did not require informed consent.

## Ethical statement

The authors declare that Ethical approval not required.

## Authors contribution

Dr. T. CASENAVE: Conceptualization, Methodology, Writing-Original draft. Dr. N. RAYNAUD ; Dr. F. GEOFFROY: Supervision, Validation, review editing. Dr. JH. TORRES: Validation & editing.

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