

Protocol

## **Chewing gum and preoperative fasting –**

### **A systematic review**

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Protocol

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## Introduction

In preparation for anesthesia fasting is an important part, and non-adherence to fasting guidelines causes surgery postponements and cancellations<sup>1</sup>. Pulmonary aspiration is the leading cause of airway-related death in anesthesia<sup>2</sup>. Fasting guidelines seek to reduce the risk of aspiration<sup>3</sup>. However, there are divergent opinions whether chewing gum prior to surgery is a clinical relevant risk factor for aspiration. International recommendations are diverse ranging from 2 hour preoperatively<sup>3</sup> to gum chewing not being a reason for postponing or cancellation of surgery<sup>4</sup>. Others do not recommend a specific fasting period on gum chewing<sup>5,6</sup>. This is probably due to conflicting results being published as some studies report that chewing gum influences gastric emptying, volume and acidity<sup>7,8</sup>, while others report no influence at all<sup>9,10</sup>. Moreover, preoperative gum chewing may even be beneficial as it can increase patient wellbeing<sup>11</sup>. The most relevant outcome measure when studying chewing gum in the preoperative period is the risk of aspiration. This outcome is difficult to investigate directly, since the risk of aspiration is small (3/10.000)<sup>12</sup>, and therefore different surrogate-outcome measures are used to give an estimate of the aspiration risk<sup>13</sup>. There is therefore a need to clarify advantages and disadvantages associated with gum chewing prior to anesthesia and if a safety interval for gum chewing prior to anesthesia can be defined. The questions are most important in elective surgery, but are also relevant factors to assess when preparing for emergency surgery.

## Materials and methods

### *Objective:*

The goal of this systematic review is to evaluate possible advantages and disadvantages on the use of preoperative chewing gum during the preoperative fasting period.

We will seek to answer the following questions:

- 1) How long time before surgery is it safe to use chewing gum?
- 2) What effects do chewing gum has on parameters affecting patient safety during anesthesia induction?
- 3) What positive effects do chewing gum in the preoperative period has?

This systematic review will be conducted in accordance with the PRISMA statement<sup>14</sup>.

### *Protocol and registration:*

The systematic review protocol will be registered at PROSPERO<sup>1</sup> (Centre for Reviews and Dissemination, University of York).

### *Eligibility criteria:*

#### *Inclusion criteria:*

Randomized controlled trials, meta-analysis, observational studies, case series and case reports reporting on chewing gum in the preoperative period will be included.

No restrictions regarding participants' age are applied.

#### *Exclusion criteria:*

Animal studies and studies reported in language other than English, French, Danish, Swedish or Norwegian are not included.

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<sup>1</sup> <http://www.crd.york.ac.uk/prospero/>

*Participants:*

- Participants will be included irrespective of surgery and age
- Patients scheduled for both elective and emergency surgery will be included
- Participants will be included irrespective of preoperative risk profile for aspiration during surgery (Diabetes, pregnant patients are included)
- Trials of healthy volunteers will be included

*Systematic literature search:*

The search will be conducted within 6 months of the date the draft is submitted for review. A systematic search of databases: PubMed, EMBASE and Cochrane Library was developed and conducted in corporation between both authors. Articles addressing “guar gum” are removed using the search term NOT, since these are not relevant to this reviews objective.

The search strategy in each databases are as follows:

PubMed:

((((((((((("Chewing Gum"[Mesh] OR "Chewing gum" OR "sugarless gum" OR "bubble-gum" OR "gum")) AND ("Pneumonia, Aspiration"[Mesh] OR "Respiratory Aspiration"[Mesh] OR "Respiratory Aspiration of Gastric Contents"[Mesh] OR aspiration))) OR (((("Chewing Gum"[Mesh] OR "Chewing gum" OR "sugarless gum" OR "bubble-gum" OR "gum")) AND ("Mortality"[Mesh] OR "mortality"[Subheading] OR "mortality")))) OR (((("Chewing Gum"[Mesh] OR "Chewing gum" OR "sugarless gum" OR "bubble-gum" OR "gum")) AND ("Gastric Emptying"[Mesh] OR "Gastric Emptying" OR "gastric motility" OR "gastric acidity")))) OR (((("Chewing Gum"[Mesh] OR "Chewing gum" OR "sugarless gum" OR "bubble-gum" OR "gum")) AND ("Fasting"[Mesh] OR "fasting" OR NPO OR "Nil-by-mouth")))) AND "humans"[Mesh]) AND (English[lang] OR French[lang] OR Danish[lang] OR Swedish[lang] OR Norwegian[lang])) NOT "guar gum")  
EMBASE:

1. exp stomach emptying/ or exp stomach motility/ or ("gastric emptying" or "gastric acidity" or "gastric motility").mp.
2. exp pulmonary aspiration/ or exp acid aspiration/ or exp aspiration pneumonia/ or aspiration.mp.
3. exp mortality/ or mortality.mp.
4. exp diet restriction/ or (fasting or NPO or nil-by-mouth).mp.
5. exp chewing gum/ or ("chewing gum" or "bubble gum" or "sugarless gum" or gum).mp.
6. ((5 and 4) or (5 and 3) or (5 and 2) or (5 and 1)) not "guar gum".mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]
7. limit 6 to (human and (danish or english or french or norwegian or swedish))

Cochrane Library:

ID	Search	Hits
#1	MeSH descriptor: [Mortality] explode all trees	
#2	MeSH descriptor: [Pneumonia, Aspiration] explode all trees	
#3	MeSH descriptor: [Respiratory Aspiration of Gastric Contents] explode all trees	
#4	MeSH descriptor: [Respiratory Aspiration] explode all trees	
#5	MeSH descriptor: [Gastric Emptying] explode all trees	

- #6 MeSH descriptor: [Fasting] explode all trees
- #7 MeSH descriptor: [Chewing Gum] explode all trees
- #8 aspiration or #2 or #3 or #4
- #9 "gastric emptying" or "gastric motility" or "gastric acidity" or #5
- #10 fasting or "nil-by-mouth" or NPO or #6
- #11 "chewing gum" or gum or "sugarless gum" or "bubble gum" or #7
- #12 (#1 and #11) or (#8 and #11) or (#9 and #11) or (#10 and #11)
- #13 #12 not (animals.sh. not (humans.sh. and animals.sh.)) not "guar gum"

Additionally, reference lists of included articles will be searched to find otherwise missed literature.

*Study selection:*

Two of the authors will independently screen the titles and abstracts found in the literature search and any unclear issues will be conferred with a senior author. Trials that do not match the inclusion criteria will be excluded.

Secondly, the remaining trials will be evaluated in full text for eligibility, and the authors will provide detailed description of the included and excluded articles. All excluded trials are listed, stating the reason for exclusion and any unclear issues will be conferred with a senior author.

*Assessment of included studies:*

The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system of rating quality of evidence and grading strength of recommendations in systematic reviews<sup>15</sup> will be used to assess our results and rate the quality of evidence and strength of recommendations for individual outcomes of the review.<sup>16</sup>

We intend to use the Cochrane Risk of Bias Assessment Tool for randomized controlled trials<sup>17</sup> Risk of bias in observational studies will be assessed using GRADE system.<sup>18</sup>

The results will be presented in a table with summary of findings.

*Outcomes*

All data from both healthcare personnel and patients will be included

Primary outcome:

1. All cause mortality
2. The beneficial effect of preoperative gum chewing defined as Patient experienced wellbeing or as defined by author

Secondary outcomes:

1. The harmful or adverse effects of preoperative gum chewing defined as Change in volume of gastric content, Change in acidity of gastric content, Change in rate of gastric emptying or as defined by author)
2. Aspiration

We will not institute any limitations regarding patient categories or outcome definitions. Surrogate outcomes will be accepted since the real outcomes (mortality and aspiration) are not expected to be found. Accepted surrogate-outcomes of aspiration are volume of gastric content and acidity of gastric content.

#### *Data collection process:*

We have developed a data extraction sheet (based on the Cochrane Consumers and Communication Review Group's data extraction template<sup>19</sup>). It will be pilot-tested on ten randomly-selected included studies and adjusted accordingly. Data extraction will be performed by two independent authors, and any disagreement resolved by consensus or by senior reviewer.

#### *Planned methods of analysis:*

Data extracted will be compared in text and tables. If possible data will be pooled using statistical analysis.

#### *Economy:*

No conflicts of interests.

#### *Publication:*

The systematic review will be reported in accordance with the PRISMA statement<sup>14</sup> and is expected to be published in a peer reviewed English-language journal. Authorship will occur in accordance with international Committee of Medical Journal Editors' rules (the Vancouver Group). The right to data and know-how that emerges in connection with the trial will belong to the primary investigator and the Department of Anesthesiology, University of Copenhagen, Herlev Hospital.

#### **Reference:**

1. Emanuel A, Macpherson R. The anaesthetic pre-admission clinic is effective in minimising surgical cancellation rates. *Anaesth Intensive Care* 2013 ; 41: 90–4.
2. Cook TM, MacDougall-Davis SR. Complications and failure of airway management. *Br J Anaesth* 2012 ; 109 Suppl: i68–85.
3. Søreide E, Eriksson LI, Hirlekar G, Eriksson H, Henneberg SW, Sandin R, Raeder J. Pre-operative fasting guidelines: an update. *Acta Anaesthesiol Scand* 2005 ; 49: 1041–7.
4. Smith I, Kranke P, Murat I, Smith A, O'Sullivan G, Søreide E, Spies C, in't Veld B. Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol* 2011 ; 28: 556–69.
5. American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Com. *Anesthesiology* 2011 ; 114: 495–511.
6. Merchant R, Chartrand D, Dain S, Dobson G, Kurrek MM, Lagacé A, Stacey S, Thiessen B. Guidelines to the Practice of Anesthesia - Revised Edition 2015. *Can J Anaesth* 2015 ; 62: 54–79.
7. Schoenfelder RC, Ponnamma CM, Freyle D, Wang S-M, Kain ZN. Residual gastric fluid volume and chewing gum before surgery. *Anesth Analg* 2006 ; 102: 415–7.

8. Søreide E, Holst-Larsen H, Veel T, Steen PA. The effects of chewing gum on gastric content prior to induction of general anesthesia. *Anesth Analg* 1995 ; 80: 985–9.
9. Sakamoto Y, Kato S, Sekino Y, Sakai E, Uchiyama T, Iida H, Hosono K, Endo H, Fujita K, Koide T, Takahashi H, Yoneda M, Tokoro C, Goto A, Abe Y, Kobayashi N, Kubota K, Maeda S, Nakajima A, Inamori M. Change of gastric emptying with chewing gum: evaluation using a continuous real-time C breath test (BreathID system). *J Neurogastroenterol Motil* 2011 ; 17: 174–9.
10. Dubin SA, Jense HG, McCranie JM, Zubar V. Sugarless gum chewing before surgery does not increase gastric fluid volume or acidity. *Can J Anaesth* 1994 ; 41: 603–6.
11. Poulton TJ. Gum chewing during pre-anesthetic fasting. *Paediatr Anaesth* 2012 ; 22: 288–96.
12. Abdulla S. Pulmonary aspiration in perioperative medicine. *Acta Anaesthesiol Belg* 2013 ; 64: 1–13.
13. Brady M, Kinn S, Stuart P. Preoperative fasting for adults to prevent perioperative complications. *Cochrane database Syst Rev* 2003 Jandoi: 10.1002/14651858.CD004423: CD004423.
14. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JP a, Clarke M, Devereaux PJ, Kleijnen J, Moher D. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med* 2009 ; 6: e1000100.
15. Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J, Norris S, Falck-Ytter Y, Glasziou P, DeBeer H, Jaeschke R, Rind D, Meerpohl J, Dahm P, Schünemann HJ. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* 2011 ; 64: 383–94.
16. Balshem H, Helfand M, Schünemann HJ, Oxman AD, Kunz R, Brozek J, Vist GE, Falck-Ytter Y, Meerpohl J, Norris S, Guyatt GH. GRADE guidelines: 3. Rating the quality of evidence. *J Clin Epidemiol* 2011 ; 64: 401–6.
17. Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, Savovic J, Schulz KF, Weeks L, Sterne JAC. The Cochrane Collaboration’s tool for assessing risk of bias in randomised trials. *BMJ* 2011 ; 343: d5928.
18. Guyatt GH, Oxman AD, Vist G, Kunz R, Brozek J, Alonso-Coello P, Montori V, Akl EA, Djulbegovic B, Falck-Ytter Y, Norris SL, Williams JW, Atkins D, Meerpohl J, Schünemann HJ. GRADE guidelines: 4. Rating the quality of evidence--study limitations (risk of bias). *J Clin Epidemiol* 2011 ; 64: 407–15.
19. Author resources | Cochrane Consumers and Communication Review Group [Internet]. [cited 2014 Dec 2] Available from: <https://cccr.org/author-resources>