



# Suggestions on management process of throat pack in orthognathic surgery: a case report and literature review

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**Background:** Throat packs are commonly used in oral surgeries to prevent accidental aspiration or ingestion. However, a forgotten throat pack can be the cause of serious postoperative complications. Although plenty of recording and warning methods have been applied, such incidents are still reported from time to time. Lack of striking marks or communication within the team is the main cause of a forgotten throat pack, and extubation before checking the number of gauzes will likely cause the throat pack to remain in the body. After literature review, quite a few related cases and precaution are available for searching, yet there is no standardized process for the use of throat pack in orthognathic surgery at present.

**Case Description:** This article reported a case in which the throat pack was lost and retrieved relying on the good teamwork and imaging methods. The patient was a 26-year-old female undergoing bimaxillary surgery for skeletal Class III malocclusion. The throat pack was missing after wound closure. Under the guidance of maxillofacial computed tomography (CT), the throat pack was found in her right nasopharynx, the patient was extubated and recovered uneventfully.

**Conclusions:** This paper reviewed the use of throat packs and its iatrogenic complications, summarized the experience based on this case and earlier literature, and formulated a standardized process for using a throat pack in orthognathic surgery.

**Keywords:** Throat pack; orthognathic surgery; complications; case report

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## Introduction

Throat packs (TPs), also known as surgical gauzes, pharyngeal packs or gauze packs, are commonly employed as a physical barrier in general anesthesia surgeries to prevent accidental aspiration or ingestion of fragments, blood and

instruments. However, the retention of TP can cause serious complications and may even lead to fatal consequences (1-3). Although considered as one of the Never Events which refers to those incidents that are believed to be preventable with appropriate measures (4,5), retained TPs occurred eight times in 2013–2014 and 2014–2015 and

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five times in 2015–2016 (6). In this article, we reported an orthognathic surgery during which the TP was missing and found back. Based on this case and literature review, we summarized the causes and countermeasures of missing TP in orthognathic surgery, and proposed a standardized process and a coping strategy to retrieve a missing TP. We present the following case in accordance with the CARE reporting checklist (available at <https://fomm.amegroups.com/article/view/10.21037/fomm-22-30/rc>).

## Case presentation

A 26-year-old female patient underwent bimaxillary surgery for skeletal Class III malocclusion under general anesthesia and nasotracheal intubation. The brackets were counted and a 7.5 cm × 7.5 cm gauze with radiopaque wire was placed in the pharynx by an assistant. Others in the operating room were informed, including the surgeon, other assistants, anesthesiologists, and nurses. On the white board the note “Throat Pack In” was written by assistant nurse right after its placement. The surgery went smooth. The patient awoke and swallowed once during suturing. After wound closure, the gauze was not found in patient’s pharynx. The scrub nurse and assistant nurse checked the note on the white board and the number of gauzes together, and confirmed that the TP had not been removed during surgery. Fiberoptic bronchoscopy was applied to inspect the oropharynx, airway and esophagus, yet no gauze was found. Meanwhile, scrub nurse, assistant nurse and the

chief nurse sorted and counted the gauzes several times and reconfirmed that TP was not taken out. The gauze was developed neither in the patient’s body nor next to the patient’s head where a gauze from the same package was placed for reference on C-arm X-ray image (*Figure 1*). Considering that it might be caused by the low-resolution ratio of X-ray, or the poor quality of the radiopaque components in these gauzes, computed tomography (CT) scan was decided to be performed immediately. Firstly, the radiopaque components were well displayed in CT images with 1mm slice thickness (SOMATOM Definition Flash, Siemens Healthineers, Forchheim, Germany) (*Figure 2*). Then, well defined high-density images were viewed in the right nasopharynx on maxillofacial CT (*Figure 3*). The patient was shifted back to the operation room. After re-disinfection, the TP was taken out with forceps successfully (*Figure 4*). The patient was then transferred to intensive care unit (ICU) for routine monitoring overnight and was extubated smoothly the next day. The rest of her recovery was uneventful.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

## Literature review

Database of PubMed, Web of Knowledge and China National Knowledge Infrastructure (CNKI) were searched independently using the search terms: (((throat pack) OR (surgical gauze)) OR (pharyngeal pack)) OR (gauze pack). Reviews, case reports and clinical studies were all included. The last search was updated on 4 August 2022. The search process was conducted by the first author, and titles and abstracts were screened by two reviewers and potentially eligible articles were read through to assess their relevance.

## Discussion

TGs are widely used in ear, nose and throat, oral and dental surgery to prevent aspiration or ingestion of blood and surgical debris, and to avoid displacement of the artificial

### Highlight box

#### Key findings

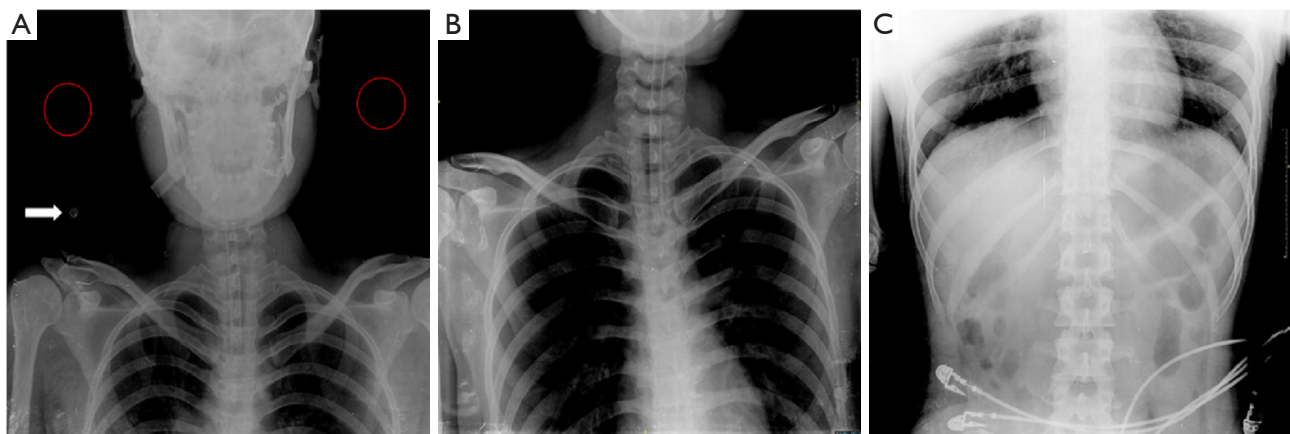
- This article reported a specific and operable management process for using a throat pack in orthognathic surgery.

#### What is known and what is new?

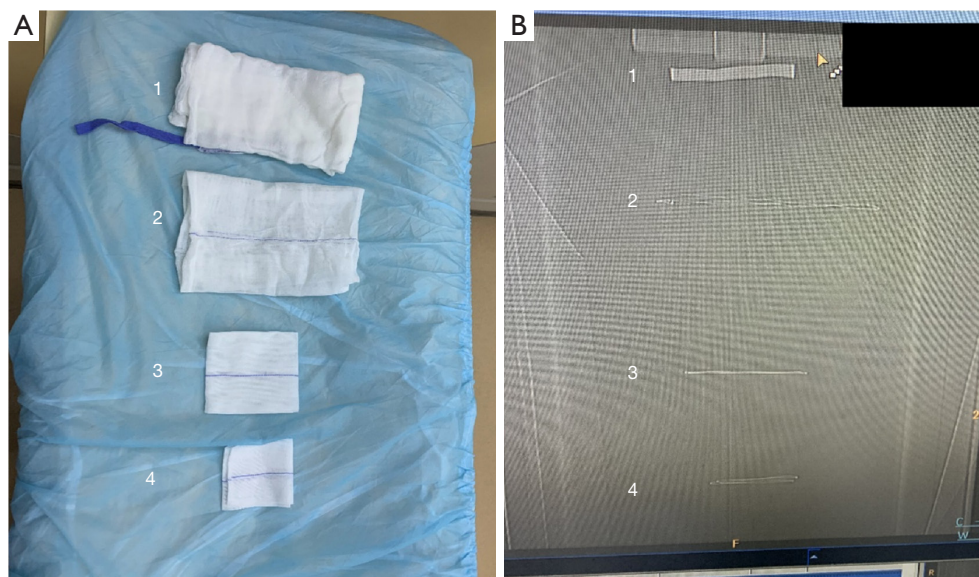
- Many precautions of missing throat pack have been proposed in different literatures, yet the suggestions are too scattered and lack of standardized processes. This article summarized the clinical experience in the literature and our center, and formulated a standardized process whose reliability has been proven by our years of practice.

#### What is the implication, and what should change now?

- The risks of using a throat pack in orthognathic surgery must be realized, and the necessity should be carefully evaluated before surgery. The implementation of a standardized process helps to avoid accidents and reduce risks.



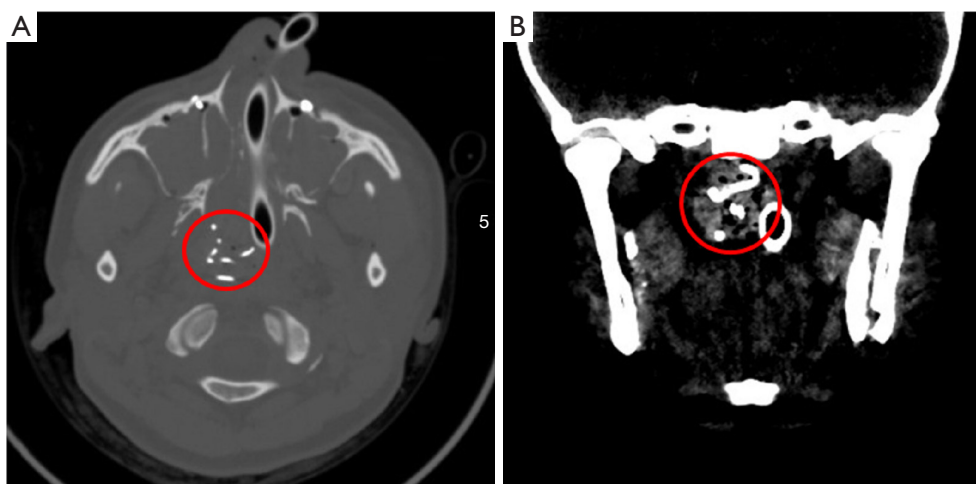
**Figure 1** No gauze developed in the X-ray films of maxillofacial region (A), chest (B) and abdomen (C). The red circles in (A) indicated where the reference gauze was placed, and the white arrow indicated the image of wire in endotracheal intubation cuff.



**Figure 2** CT was performed on 4 types of gauzes which were used in regular orthognathic surgery, and all wires developed well. CT, computed tomography.

airway device (7). They were also thought profitable in alleviating postoperative nausea and vomiting (PONV). However, many recent research has pointed out that the usage of TP had little benefit in reducing PONV, but was instead associated with worse sore throats and postoperative dysphagia (8-10). A randomized, controlled research has confirmed it as a predisposing factor for postoperative aphthous stomatitis (11). Although in two studies the TP soaked with a combination of chlorhexidine gluconate and benzydamine hydrochloride (CGBH) was used to

reduce sore throats, the difference did not reach statistical significance (12,13). Therefore, using TP to alleviate PONV was not recommended. As a regular means to prevent accidental aspiration and ingestion, the merits of TP are rarely discussed in the article. After all, the incidence of these complications is itself very low. But this does not mean that this method is not beneficial. For orthognathic patients who have isolated brackets and attachments in their mouths, the placement of TP is still a low-cost, simple and effective measure.



**Figure 3** High-density continuous strip-like images could be seen in the right nasopharynx on the CT image (the red circle), which were considered to be the wire in TP. CT, computed tomography; TP, throat pack.



**Figure 4** The missing TP was removed smoothly. TP, throat pack.

However, a forgotten TP could lead to airway obstruction, foreign body *in vivo* and postoperative infection. Many cases of missing TPs have been reported in earlier literature (14-18). Ninety-three (38.27%) Indian anesthesiologists participated in a nationwide survey had encountered retained TP which led to airway obstruction in 37.6% cases (19), while 42 respondents of a national survey in the UK reported 52 critical incidents of retained TP (2). In some cases, the missing TP was found and retrieved soon after the surgery, under endoscopy or vomited out by the patient. Muñoz and Villafruela reported a case in which the forgotten gauze had been left in a 6-year-old boy for 3 weeks before removed (18). In a case reported by Ozer *et al.* the gauze was removed 6mo after adenotonsillectomy, causing the patient's purulent rhinorrhea, nasal obstruction, halitosis, and mouth breathing after surgery (14). The accidental ingestion of TP has not only happened in general

anesthesia surgeries, but also local anesthesia surgeries. A 66-year-old woman swallowed the TP without notice during an endoscopic dacryocystorhinostomy (en-DCR) (20).

The common causes of a forgotten TP may include, but are not limited to, the following:

- (I) Putting a TP without informing other staff, or the shift of crew.
- (II) Putting a TP without a visual reminder.
- (III) Extubating before doing the final gauze count;
- (IV) False statement that the TP has been removed;
- (V) More TPs placed than removed, or a torn TP.

In order to avoid a retained TP, a couple of aspects are important to note here:

- (I) Type of surgery: a consensus should be reached on which type of surgery or patient shall use a TP. For example, patients with orthodontic devices, loosen teeth or bone fragments, or those who need small, easily broken instruments during surgery. Anesthesiologists and surgical nurses collaborate with different doctors every day. A clear consensus let them know under what circumstances a TP will be used, so that they can remind doctors to remove it when necessary.
- (II) Person in charge: a regular staff should be assigned to place and take out the TP. Otherwise, everyone may think that someone else will place the TP, or, conversely, multiple TPs may be put by more than one person. In our center, the task is usually done by the chief surgical assistant because he/she usually participates in the whole process of the

surgery and is not subbed. If the assistant needs to be changed, it must be verbally communicated whether a TP has been placed.

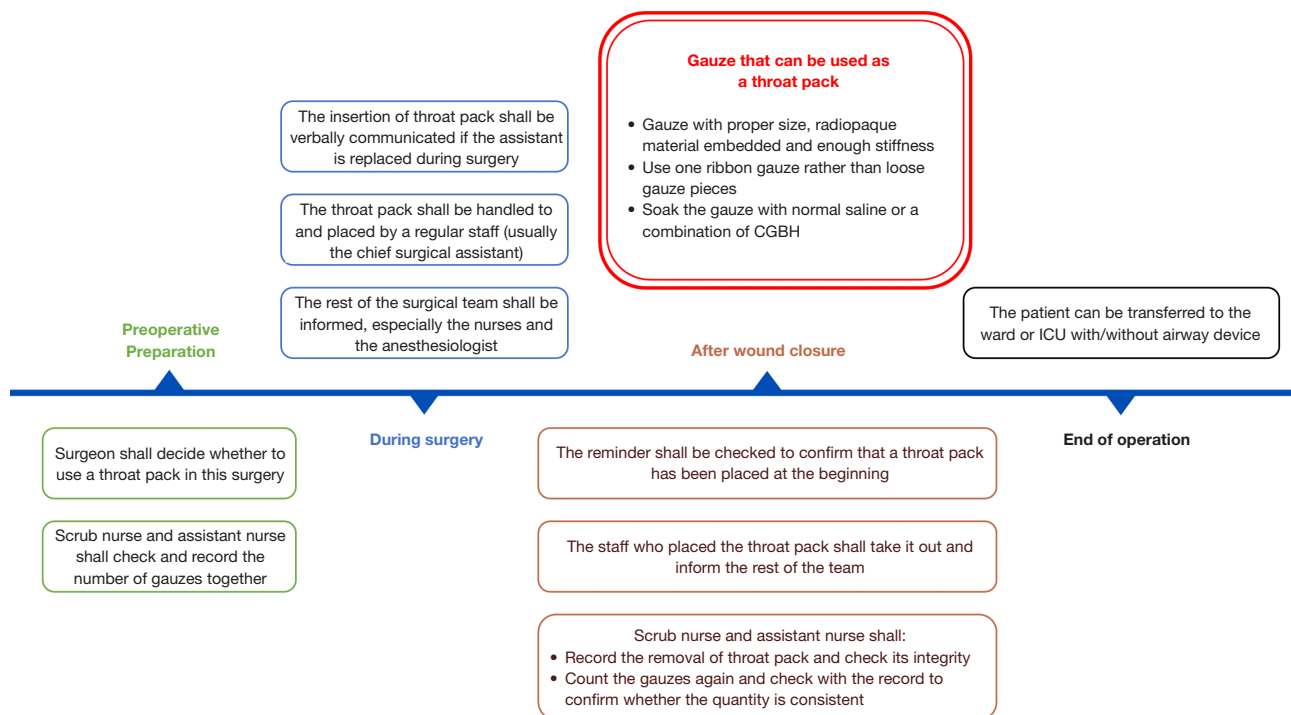
- (III) Teamwork: all medical staff in the operating room should be informed when the TP is placed, especially the nurses and the anesthesiologist. The surgeons need to check the number of brackets and attachment, and the scrub nurse and assistant nurse need to check the number of gauzes together before and after surgery. The incisions of orthognathic surgery are usually too small to accommodate TP, therefore the gauze count can be done after wound closure. In other oral surgeries, such as oral tumor resection, the gauzes should be checked before suturing. The anesthesiologist needs to check the pharyngeal cavity for foreign bodies before extubation, and the patient must not be extubated before the TP is confirmed.
- (IV) Visual reminder: at least one visual reminder should be made when the TP is placed, such as a mark on patient's face, a tab on the airway device, or a label attached to the surgical assistant's hat (21). In our center, a reminder is always written on the white board by assistant nurse, and will be erased the only after he/she see the removed TP after surgery. Some articles suggest leaving part of the TP protruding externally, but the external end would interfere with the occlusion, which makes this method not applicable in orthognathic surgery.
- (V) Type of gauze: only one gauze with proper size, radiopaque material embedded and enough stiffness can be used as the TP. We recommend to use a 10 cm × 10 cm gauze soaked with normal saline or CGBH, because an oversized gauze or a dry gauze will increase the risk of sore throats and postoperative ulcers. Small gauze pieces are not easy to be found (just like the TP in our case), and have higher risk of being left in the incisions. Using loose gauze pieces or a fragile gauze will make it

hard to find out if there are any pieces left. A gauze without radiopaque material embedded cannot be seen on X-ray or CT, therefore, the patient will have to undergo invasive examination such as an endoscopy to look for the missing TP.

- (VI) Coping strategy: if the TP is missing during surgery, its location must be determined immediately. Visual reminder and the number of gauzes should be checked to make sure whether a TP has been placed. Fiberoptic bronchoscopy can be used to inspect nasopharynx and oropharynx, and then X-ray or CT for further inspection if necessary. In patient with intraoral brackets, CT in maxillofacial region is recommended because the metal artifact will make the TP difficult to distinguish on X-ray. The TP should be retrieved under direct visualization or endoscope once it is found because it would not go too deep in a short period. The most important thing to prevent accidental aspiration or ingestion is that the patient can be extubated only after confirming that the TP is taken.

## Conclusions

In this case, we showed a management process of missing TP during orthognathic surgery, similar to but more specific and operable than the existing recommendations (6) (*Figure 5*). One reason for this case was that the gauze used as TP was too small, and the patient's awakening and gulp made us mistakenly think that the gauze was swallowed, neglecting the examination of nasopharynx. It was precisely because of such a standardized process that the missing TP could be retrieved immediately without serious consequences. It must be admitted that the use of TP has certain risks, and its indication and necessity should be carefully evaluated before surgery. The most important thing to prevent serious complications is not to do the extubation before the missing TP is found and retrieved.



**Figure 5** The standardized process for the use of TP in orthognathic surgery. CGBH, chlorhexidine gluconate and benzydamine hydrochloride; ICU, intensive care unit; TP, throat pack.

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## Footnote

**Reporting Checklist:** The authors have completed the CARE reporting checklist. Available at <https://fomm.amegroups.com/article/view/10.21037/fomm-22-30/rc>

**Conflicts of Interest:** All authors have completed the ICMJE uniform disclosure form (available at <https://fomm.amegroups.com/article/view/10.21037/fomm-22-30/coif>). The authors have no conflicts of interest to declare.

**Ethical Statement:** The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical

standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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