

1 **A Feasible Approach for Extraction of Dental Prostheses from the**
2 **Airway by Flexible Bronchoscopy in Concert with Wire Loop Snare**

3 —Original Research—

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12 **Running head: Flexible Bronchoscopy for Tracheobronchial Dental Prostheses**

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Abstract

Objective

Tracheobronchial foreign body (TFB) aspiration is rare in adults, although incidence rates increase with advancing age. Bronchoscopic removal of airway FBs can be safely accomplished with both rigid as well as flexible bronchoscopes. A wide variety of instruments, such as biopsy forceps, Fogarty balloon catheters, alligator forceps, or wire baskets, are commonly available for removal. To determine whether flexible bronchoscope in concert with wire loop snares is effective to extract the airway dental prostheses and the factors to affect the success rate to remove the airway dental prostheses by this method.

Patients

A total of 7 patients with airway dental prostheses aspiration from 2007 to 2010 were reviewed. These patients underwent flexible bronchoscopy with a wire loop snare under local anesthesia without fluoroscopic guidance throughout the procedure.

Measurements and Main Results

Seven patients (mean [\pm SD] age, 58.4 ± 17.4 years; 71% men) underwent flexible bronchoscopy in concert with wire loop snares to extract these dental prostheses from the airway. Two patients (29%) were intubated with ventilator dependence during the procedures. The locations of these dental prostheses were left lower bronchus (n=3, 43%), left main bronchus (n=2, 29%), right lower bronchus (n=1, 14%) and right

1 tranchus intermidis (n=1, 14%). Of these 7 patients, 5 patients (71%) were extracted
2 their airway dental prostheses successfully. These 2 patients who cannot be extracted
3 by this method were single teeth with round shape such as molar or premolar. No
4 complications occurred by the procedures.

5 ***Conclusions***

6 Although we have only 7 cases to illustrate this wire loop snare technique, we
7 believe that this will assist the pulmonologist in their approach to airway foreign body
8 extraction, especially for dental prostheses. A flexible bronchoscope in concert with a
9 loop snare can grasp the dental prosthesis tightly than either grasping forceps or wire
10 baskets, with less need for a rigid bronchoscope or fluoroscope.

11

12 **Key words:** airway, bronchoscopy, dental prostheses

Introduction

1

2 Tracheobronchial foreign body (TFB) aspiration is rare in adults, although
3 incidence rates increase with advancing age. Risk factors for TFB aspiration in adults
4 are a depressed mental status or impairment in the swallowing reflex. The kinds of the
5 TFBs are variable, such as food, bone fragments, toys, coins, tablets, teeth and dental
6 prostheses [1]. The peak age is bimodal distribution, common in younger children and
7 older adults [2-3].

8 With the advancement of bronchoscopy and grasping instruments, there are
9 numerous methods available for the extraction of airway FBs, including rigid and
10 flexible bronchoscopy [4-5]. However, there are few reports regarding the effective
11 extraction of dental prostheses from the airway. The irregular surface and hard
12 composition of dental prostheses make them particularly difficult to grasp and extract
13 using normally effective instruments (biopsy forceps, Fogarty balloon catheters,
14 alligator forceps, or wire baskets). Moreover, their sharp edges can facilitate
15 impaction. For these reasons, we report a new method to remove dental prosthesis in
16 airway by using a flexible bronchoscope in concert with a wire loop snare under local
17 anesthesia without fluoroscopic guidance.

1 **Materials and Methods**

2 ***Enrolled Patients***

3 Over a period from 2007 to 2010, flexible bronchoscopy in concert with wire loop
4 snares to extract tracheobronchial dental prostheses was performed in 7 consecutive
5 patients. Informed consent was obtained from each patient and/or their family prior to
6 this procedure. Hospital records and procedure notes were reviewed in order to extract
7 the followings: age, gender, type of dental prostheses, locations of dental prostheses,
8 and occurrence of procedure-related complications.

9 ***Patients***

10 During the study period, 7 patients (5 males and 2 females; mean age, 58.4 ± 17.4
11 years [\pm SD]; range, 26-84 years) with airway dental prostheses were enrolled. Two
12 patients had indwelling endotracheal tubes. Patients' baseline characteristics are
13 summarized in Table 1. The locations of dental prostheses were left side airway (n=5,
14 71%) and right side airway (n=2, 29%).

15 ***Bronchoscopic procedure***

16 A flexible bronchoscope (BF-1T260; Olympus; Tokyo, Japan) was inserted through
17 the patient's oral cavity or endotracheal tube and introducing a wire loop snare
18 through the working channel of the flexible bronchoscope with direct visualization of
19 the airway dental prosthesis. The dental prosthesis was ensnared by the wire loop

1 snare, and then the scope, snare, and dental prosthesis were all pulled out together
2 (Figure 1). These patients underwent local anesthesia without fluoroscopic guidance
3 and they tolerated this procedure well with only minimal discomfort.

Results

Seven adult cases of tracheobronchial dental prostheses from the year 2007 to 2010 were admitted to China Medical University Hospital (CMUH). The clinical features of the 7 patients are summarized in Table 1. The male/female ratio was 2.5. The mean age was 58.4 years (range, 26 to 84 years).

The cause of the airway dental prostheses were medical procedures related (n=4, 57%) and aspiration (n=3, 43%). Of the 4 patients with medical procedures related, three patients were intubation related and one was dental manipulation related.

Symptoms associated with airway dental prostheses in our patients range from **dyspnea (n=5, 71%), foreign body sensation (n=3, 43%), cough (n=3, 43%), fever (n=1, 14%) and desaturation (n=1, 14%). But two patients (n=2, 29%) were free**

of symptoms. With regard to radiological findings, all of them were detected by chest radiography (Figure 2). The locations of these dental prostheses were left lower bronchus (n=3, 43%), left main bronchus (n=2, 29%), right lower bronchus (n=1, 14%) and right tranchus intermidis (n=1, 14%).

There were two patients failed to extract their dental prostheses by this method. One patient received rigid bronchoscopy in operation room to extract dental prostheses successfully **on the next day** and the other patient died of his underlying Child C liver cirrhosis **related spontaneous bacterial peritonitis in septic shock**

1 **and multiple organs failure** two weeks later. No complications occurred by the
2 procedures.

3 Focusing on the factors affecting the successful extraction of the airway dental
4 prostheses, single tooth impact the airway was the main factor affecting airway dental
5 prostheses extraction. The molar or premolar teeth with irregular shape cannot be
6 ensnared by the loop snare and cannot be grasped by this procedure. The attempts at
7 removal of the molar or premolar teeth with flexible bronchoscopy with the use of
8 biopsy forceps and wire baskets were also unsuccessful because the object could not
9 be grasped with the biopsy forceps as a result of the slippery surface and could not be
10 grasped with the wire baskets because of its irregular shape impacting the airway.

Discussions

1
2 Aspiration of **foreign bodies (FBs)** are common in children than in elderly people,
3 however, the peak age is bimodal distribution. Teeth and dental prostheses play major
4 roles of them. The incidence of FB aspiration in adults is unknown but male patients
5 are predominant. The classical symptoms are cough, dyspnea or cyanosis; but only a
6 small percentage of patients fit all of them. Non-asphyxiating FB may be
7 asymptomatic, so the diagnosis can be delayed for months to years. The most
8 common risk factors in adults are older age, dental manipulation, tracheostomy care,
9 medical procedures, trauma with loss of consciousness, neurological disorders, mental
10 retardation, intravenous drug addiction, and alcoholism. Of the variable objects, we
11 could differentiate into four groups: iatrogenic, organic, inorganic and
12 cranioencephalic traumatism related [1]. The most common iatrogenic procedures
13 include tracheostomy care, dental manipulation, endotrachial intubation, and
14 fibrobronchoscopy performance.

15 Prompt removal of the foreign body is necessary to avoid complications. Both rigid
16 and flexible bronchoscopies have been utilized in the removal of foreign bodies. The
17 successful rate is almost the same. Rigid bronchoscopy has advantage of better airway
18 control, direct visualization and easier use of removal instruments. However, some
19 patients are not candidates for transfer to operation room for rigid bronchoscopy with

1 a general anesthesia because of illness severity and patient's refusal. Flexible
2 bronchoscopy for removal tiny and far-reaching FBs might be superior to rigid
3 bronchoscopy. Several studies in the late 1980s and early 1990s have supported the
4 use of flexible bronchoscopy in the initial evaluation of TFB aspiration. In adults,
5 rigid bronchoscopy should be reserved as a final therapeutic approach to TFB
6 aspiration. In one previous report, flexible bronchoscopy (72 %), rigid bronchoscopy
7 (12.5 %) and thoracotomy (15.5 %) have been utilized in the removal of TFBs [1].
8 Various instruments via bronchoscopy are available for FB extractions, including
9 forceps, snares, and suction catheters. There are also reports of the use of a Fogarty
10 balloon catheter or cryotherapy [6-7]. There is no previous reports focus on the
11 extraction of tracheobronchial dental prostheses. We introduce an effective way to
12 remove dental prostheses firmly impacted in the airway.

13 In the presence of a high clinical suspicion, bronchoscopy should be performed for
14 a thorough evaluation of the airway [8]. Flexible bronchoscopy is the gold standard in
15 the identification and localization [9]. The use of bronchoscopy for FB removal was
16 first introduced by Gustav Killian in 1897 [10]. Bronchoscopic extraction of airway
17 FBs can be safely accomplished with both the rigid as well as the flexible
18 bronchoscopes in adults and children. Review of large series of FB removal indicates
19 a success rate of 86% with flexible bronchoscopy [9]. The success rate of our

1 procedure was 71% for teeth in airway. Base on our limit experiences, we found that it
2 is easier and more suitable to extract dental bridge (success rate =100%) than single
3 tooth (success rate =60%) by using the wire loop snares method. The airway dental
4 bridge is difficult to grasp by biopsy forceps, wire baskets or ballon catheter. Using
5 the wire loop snares to grasp the dental bridge is effective and time saving comparing
6 to traditional procedure. From our two patients with airway teeth who cannot be
7 grasped by loop snare because the single molar or premolar teeth with round shape
8 were difficulty be ensnared with loop snare. Rigid bronchoscopy is necessary to
9 extract this kind of airway teeth.

10 A delay in diagnosis increases morbidity including cough, wheeze, edema,
11 granulation tissue formation, obstructive pneumonitis and pneumonia. Bronchoscopic
12 evaluation and removal should be performed as soon as the diagnosis is suspected [8].
13 In our series, the duration of an event to diagnosis was almost less in few hours and
14 the duration of diagnosis to bronchoscopy performance was less in 24 hours if the
15 patient's condition is stable. Findings on radiographic imaging include visualization of
16 a radiopaque FBs, atelectasis, postobstructive changes, mediastinal shift and
17 pneumomediastinum [8]. In our series, all the dental prostheses can be seen in the
18 chest radiography because of the radiopaque materials such as metal or teeth may be
19 easily identified on CXR. The most frequent location is the right bronchial tree in

- 1 most populations [11], but left bronchial tree FB is more frequent than right side in
- 2 our series. The location of airway FB was dependent on the patient's position when
- 3 he/she aspirated the dental prostheses.

Conclusions

1

2 Tracheobronchial dental prostheses may be introduced to remove by flexible
3 bronchoscopy in concert with wire loop snares, especial for dental bridge. This
4 procedure is a less invasive, convenient, and time-saving method to extract airway
5 dental prostheses.

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Figure Legends

1

2 **Fig. 1.** (A) Snare catheter protruding from end of working channel of a flexible
3 bronchoscope with the loop passed around the dental prosthesis. (B) Loop tightened
4 around the neck of the dental prosthesis for removal.

5 **Fig. 2.** Chest radiograph showing a radiopaque dental bridge in left main bronchus.

1 **Table 1.** Clinical characteristics of the patients

Case	Gender	Age	Symptoms	Etiology	Teeth	Site	CXR findings	Successful removal
#1	F	63	Yes	intubation	single tooth	left main bronchus	left lung collapse	Y
#2	M	42	Yes	TEE	single tooth	right lower bronchus	N	Y
#3	M	62	None	intubation	single molar	left lower bronchus	N	N
#4	F	26	Yes	aspiration	single premolar	left lower bronchus	N	N
#5	M	84	None	dental procedure	dental bridge	left lower bronchus	N	Y
#6	M	66	Yes	aspiration	single tooth	right intermediate bronchus	right middle collapse	Y
#7	M	66	Yes	aspiration	dental bridge	left main bronchus	N	Y

2 * TEE: trans–esophageal echocardiography

1 利用軟式支氣管鏡合併圈套裝置執行呼吸道齶齒夾取的經驗回顧

2 沈德群^{1,2} 涂智彥 陳家弘 陳鴻仁 劉奕亨 夏德椿 施純明 徐武輝

3 前言

4 呼吸道異物吸入可能是個相當棘手的問題。脫落的齶齒是最常見的呼吸道異
5 物種類之一。硬式及軟式支氣管鏡搭配不同的器械，在臨床上，被廣泛地用來處
6 理各式的呼吸道異物。本文引介使用軟式支氣管鏡合併圈套裝置，執行呼吸道齶
7 齒夾取之經驗，並探討影響成功率的若干因子。

8 方法

9 我們回顧了最近四年內，所有執行之支氣管鏡異物夾取的病例。其中有七例
10 被確認是利用軟式支氣管鏡合併圈套裝置，來處理呼吸道齶齒嵌入的狀況。每個
11 病例都被重新詳細地檢視及歸納，以期能獲得可信的結論。

12 結果

13 七個病例當中，包括五位男性，兩位女性，平均年齡為五十八歲。其中有兩
14 位病人執行檢查時，是被插管並輔以呼吸器使用的。齶齒嵌入的位置包括左下支
15 氣管三例，左主支氣管兩例，右下支氣管一例與右中間支氣管一例。其中五個病
16 例成功地將齶齒取出。兩個未能取出的病例都是單一顆牙齒，形狀都是接近圓形
17 的白齒或前白齒。沒有任何術中或術後的相關併發症發生。

18 結論

19 利用軟式支氣管鏡合併圈套裝置，執行呼吸道齶齒夾取是個相當可行的方

1 式。由於病人只須在局部麻醉之下接受處置，相對來說，這是個侵入性低、省時、
2 便利、安全又經濟的方法。

3

4 **關鍵詞:** 呼吸道，支氣管鏡，贗齒

5

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