

# THE USE OF FLEXIBLE FIBEROPTIC CYSTOSCOPE FOR DIFFICULT ENDOTRACHEAL INTUBATION IN TMJ ANKYLOSIS PATIENTS: A CASE SERIES

TAISEER HUSSAIN AL-KHATEEB<sup>1</sup>  
AND DAHER K RABAD<sup>2</sup>

## Abstract

**Background:** Fiberoptic bronchoscopes might be vital for the safe performance of difficult endotracheal intubations. However, many hospitals in low or middle-income countries are unable to afford the equipment. We describe the use of a flexible fiberoptic cystoscope, as an alternative to a bronchoscope, for difficult nasoendotracheal intubation in patients with temporomandibular joint ankylosis.

**Methods:** Eight Jordanian patients (five females and three males) with severe restriction of mouth opening, due to ankylosis of the temporomandibular joint, underwent awake nasoendotracheal intubation using a flexible fiberoptic cystoscope under local anesthesia.

**Results:** The procedure was successful and well tolerated in all eight patients.

**Conclusion:** A flexible cystoscope can be a successful alternative to a flexible bronchoscope, for difficult nasoendotracheal intubation in hospitals at rural areas in low-or middle-income countries with limited financial resources.

**Keywords:** TMJ ankylosis, fiberoptic, cystoscope, intubation

## Introduction

Congenital and acquired diseases or conditions may alter the airway anatomy to such extent that attaining and maintaining a patent airway during anesthesia may be difficult or impossible. One example of acquired conditions is temporomandibular joint (TMJ) disorders, notably bony ankylosis. During endotracheal intubation, the anesthesiologist typically attempts both rotational and translational movements of the TMJ to allow for the maximum opening of the patient's mouth. This maneuver aids in successful direct visualization of the epiglottis and vocal cords, and consequently allows for the atraumatic passage of an endotracheal tube.

An updated report by the American Society of Anesthesiologists (ASA) Task Force on Management of the Difficult Airway specifically confirms that an airway physical examination, for acquired or congenital disease states, should be conducted before the initiation of anesthetic care

1 BDS, MScD, FDSRCS, FFDRCS, Professor, Consultant in Oral and Maxillofacial Surgery, Jordan University of Science and Technology and King Abdulla University Hospital, Irbid 22110, P.O. Box: 3030, Jordan, Tel: +962795672779. E-mail: taiseerhkh@yahoo.com

2 VRACH, JBOARD, Associate Professor, Consultant in Anaesthesiology, Jordan University of Science and Technology and King Abdulla University Hospital, Irbid 22110, P.O. BOX: 3030, Jordan, Tel: +962772075375. E-mail: daherrabadi@yahoo.com

**Corresponding Author:** Prof Taiseer Hussain Al-Khateeb, Professor, Consultant in Oral and Maxillofacial Surgery, Jordan University of Science and Technology and King Abdulla University, Irbid 22110, P.O. Box: 3030, Jordan, Tel: +962795672779. E-mail: taiseerhkh@yahoo.com

and airway management in all patients<sup>1</sup>. Fiberoptic-guided intubation was one of the main strategies for intubation of the difficult airway<sup>1</sup>. However, there are hospitals in low and middle-income countries who do not have enough resources to acquire the equipment. In fact purchasing these costly instruments would consume a significant part of their yearly budget. The Hashemite Kingdom of Jordan was classified by the World Bank as a country of “middle income”<sup>2c</sup>. Due to slow domestic growth, high energy and food subsidies and, lately, the Syrian refugee crisis, Jordan usually runs annual budget deficits<sup>3</sup>. In Jordan, health care system services remain highly concentrated in the capital Amman<sup>4</sup> with little and limited governmental health spending directed towards rural areas.

This article describes the use of a flexible fiberoptic cystoscope as a tool to nasoendotracheal intubation in eight patients with severe restriction of mouth opening due to ankylosis of the TMJ.

## Methods

Between 2002 and 2015, eight patients (five females and three males) with severe restriction of mouth opening resulting from ankylosis of TMJs presented to King Abdullah University Hospital, Irbid, Jordan (Table 1). The age of patients ranged from eight to 40. All patients were classified an ASA1 physical status. During the preoperative anesthetic assessment, these patients were considered unsuitable

for intubation after induction of general anesthesia due to uncertainty about the ability to ventilate or intubate after induction of general anesthesia. In the operating room, fiberoptic-guided awake intubation, under local anesthesia of the airway was planned. Due to financial restrictions, a flexible bronchoscope was not available, therefore, a flexible cystoscope was used instead.

## Technique

The flexible cystoscope (Wolf Cystoscope Model # 7305-006, USA) was checked for size match relative to the lumen of the endotracheal tube. The insertion cord of the cystoscope was lubricated to move freely within the lumen of the endotracheal tube. After establishing a reliable intravenous access and standard monitoring placement, lidocaine 4% was used for topical anesthesia and vasoconstriction of nasal mucosa to prevent bleeding. Sprays (4-5 puffs) of 4% lidocaine were delivered onto the tongue base and the adjoining lateral pharyngeal walls. Topical anesthesia of the trachea, larynx and hypopharynx was obtained by passing a 25-gauge needle through the cricothyroid membrane. After aspiration of air to confirm settlement within the tracheal lumen, 3 mL of 4% lidocaine was injected.

Following routine pre-induction administration of oxygen, the endotracheal tube, lubricated with lidocaine gel, was inserted gently through the prepared nostril into the oropharynx. To prevent the tube from entering

*Table 1*  
*clinical details of patients included in this article*

patients	Age (yrs)	Gender	Mouth opening	Diagnosis
1	8	F	8mm	Left TMJ bony ankylosis
2	12	F	10mm	Left TMJ bony ankylosis
3	23	F	7mm	Left TMJ bony ankylosis-recurrent
4	33	F	6mm	Bilateral TMJ bony ankylosis
5	40	M	10mm	Bilateral fibrous ankylosis of TMJ
6	35	M	4mm	Bilateral Post-radiation fibrosis
7	19	M	10mm	Bilateral TMJ bony ankylosis
8	34	F	13mm	Bilateral TMJ bony ankylosis-recurrent

the hypopharynx and being directed away from the midline, thus interfering with laryngeal exposure, the tube was not advanced too far distally. The secretions were suctioned through the endotracheal tube, and the cystoscope was inserted through its lumen into the oropharynx. Once the epiglottis and vocal cords were seen, the endotracheal tube was advanced into the larynx and the cystoscope was withdrawn. Successful intubation was noted when the patient was unable to phonate, humidification within the endotracheal tube was noted with ventilation, and carbon dioxide was noted on the capnograph. IV induction of general anesthesia was then commenced.

### *Ethics approval*

A written informed consent was obtained from each patient prior to the use of the flexible fiberoptic cystoscope. Due to the retrospective nature of the study and the fact that no experiments were done, no ethical approval was necessary. No parts of any patient is shown.

### **Results**

The procedure was successful in all eight cases, and all patients tolerated the procedure well. No complications were encountered.

### **Discussion**

Most of the techniques and devices routinely used in clinical practice (awake intubation, blind oral or nasal intubation, fiberoptic intubation, intubating stylet or tube-changer, supraglottic airway or, most recently, light wand videolaryngoscope) maintain airway patency by way of manipulation of the structures of the upper airway. Failure to securing and sustaining a patent airway certainly results in hypoxic brain injury or death. Despite the fact that during the last three decades, mortality figures associated with anesthesia dropped to 0.04-7 per 10, 000 patients administered anesthetics<sup>5</sup>, a qualitative analysis of mortality associated with anesthesia found that 10% of the anesthesia-related deaths were associated with inadequate respiratory management<sup>5</sup>.

A famous cause of difficult airway is a restricted mouth opening. If the mouth opens less than 25 mm, it is unlikely that any part of the larynx will be visualized by direct laryngoscopy. Restricted mouth opening results from a number of disorders that affect the TMJ and its adjacent structures. It can be classified according to the location of the problem (intra or extra articular), type of tissue involved (osseous, fibrous) and the extension of the fusion (complete or incomplete). TMJ ankylosis precludes or excessively restrains the range of mandibular motion. When it occurs before facial growth is completed, it produces micrognathia, especially if the disease is bilateral. Deviation of the mandible to the affected side occurs when it is unilateral<sup>6</sup>. The difficult intubation in TMJ ankylosis classically results from severe restriction of mouth opening that is often associated with mandibular underdevelopment with an abnormal laryngeal position<sup>7</sup>.

For intubation of patients with a difficult airway (e.g. restricted mouth opening), the updated practice guidelines of the ASA<sup>1</sup> recommends the following algorithm:

1. Assess the likelihood and clinical impact of basic management problems, including difficulty with: patient cooperation, mask ventilation, supraglottic airway placement, laryngoscopy, intubation, or surgical airway access.
2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.
3. Consider the relative merits and feasibility of basic management choices including:
  - Awake intubation vs. intubation after induction of general anesthesia
  - Non-invasive technique vs. invasive techniques for the initial approach to intubation
  - Video-assisted laryngoscopy as an initial approach to intubation
  - Preservation vs. ablation of spontaneous ventilation
4. Develop primary and alternative strategies.

There are no absolute contraindications for awake intubation other than a true allergy to local anesthetics. Relative contraindications include patient refusal and

the uncooperative patient<sup>1</sup>. A flexible scope facilitates awake tracheal intubation because, under good topical anesthesia, the procedure is painless and well tolerated by patients<sup>8</sup>. Spontaneous ventilation keeps the airway open, and deep breathing can assist the endoscopist in locating the glottis when airway anatomy is distorted. We used the method of awake intubation under topical anesthesia because we feel that it is safer to intubate a conscious patient breathing spontaneously when the airway is compromised or tracheal intubation cannot be guaranteed. This is particularly true in our situation of limited equipment and work force imposed by the poor financial resources.

In our cases, as the patient's maximal mouth opening ranged from 4-13 mm. We chose trans-nasal fiberoptic intubation under local anesthesia, with the patient breathing spontaneously. In addition to minimizing the patient's discomfort and aiding tolerability of the procedure, local anesthesia also helped to avoid the possibility of laryngospasm.

Modern fiberoptic technology has improved

the visualization of hidden or obscure structures and enabled health professionals to perform non-invasive and less traumatic laparoscopic, endoscopic, and arthroscopic procedures. However, the cost of the equipment is frequently unaffordable to many hospitals in the developing world. We have found that the use of fiberoptic cystoscopes can be helpful in managing difficult airways when a bronchoscope is unavailable. The use of a cystoscope for endoscopy of the airway has previously been published in two case reports<sup>9,10</sup>. However, we are the first to report its use in a case series. The main drawback of its use is that, unlike a bronchoscope, the flexible cystoscope provides a relatively small field of vision and rough images.

In conclusion, although the bronchoscope is better suited for the airway endoscopy, we have found that the use of a flexible fiberoptic cystoscope can be helpful in managing difficult airways when a bronchoscope is not available in hospitals in low or middle-income countries with limited financial resources.

## References

1. APFELBAUM JL, HAGBERG CA, CAPLAN RA, ET AL: American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology*; 2013, 118(2):251-270.
2. Country and Lending Groups: *Data.worldbank.org*, Retrieved 3 December 2015.
3. SHARP JM: Jordan: Background and US Relations. *Congressional Research Service*; 2015, Sept. 3-16.
4. Jordan country profile: Library of Congress Federal Research Division; September 2006.
5. ARBOUS MS, GROBBEE DE, VAN KLEEF JW, ET AL: Mortality associated with anaesthesia: a qualitative analysis to identify risk factors. *Anaesthesia*; 2001, 56(12):1141-1153.
6. SATHEESHKUMAR PS, MOHAN MP, JACOB J: Restricted mouth opening and trismus in oral oncology. *Oral Surg Oral Med Oral Pathol Oral Radiol*; 2014, 117(6):709-715.
7. VAS L, SAWANT PA: A review of anaesthetic technique in 15 paediatric patients with temporomandibular joint ankylosis. *Paediatr Anaesthesia*; 2001, 11(2):237-244.
8. MACDOUGALL M, MOHAN A, MILLS J, MUNAVVAR M: Randomized comparison of 2 different methods of intrabronchial lidocaine delivery during flexible bronchoscopy: a pilot study. *J Bronch Intervent Pulmonol*; 2011, 18(2):144-148.
9. MALHOTRA V: Flexible cystofibrescope for difficult intubation. *Canad J Anaesthesia*; 1991, 38(8):1071.
10. ROARK GL: Use of a fiberoptic cystoscope to facilitate intubation in a difficult airway. *Tropic Doct*; 2006, 36(2):104-105.





bridion<sup>®</sup>  
sugammadex

Predictable. Complete. Rapid.

## BRIDION—for optimal neuromuscular blockade management and improved recovery

### Predictable and complete reversal

- 98% of BRIDION patients recovered to a TOF<sup>\*</sup> ratio of 0.9 from reappearance of T<sub>2</sub><sup>†</sup> within 5 minutes<sup>2</sup>
- 97% of BRIDION patients recovered to a TOF<sup>\*</sup> ratio of 0.9 from 1 to 2 PTCs<sup>†</sup> within 5 minutes<sup>3</sup>

### Rapid reversal

- BRIDION rapidly reversed patients from reappearance of T<sub>2</sub><sup>†</sup> in 1.4 minutes<sup>2</sup>
- BRIDION rapidly reversed patients from 1 to 2 PTCs<sup>†</sup> in 2.7 minutes<sup>3</sup>

**BRIDION is indicated for the reversal of neuromuscular blockade induced by rocuronium or vecuronium. In children and adolescents (aged 2-17 years), BRIDION is only recommended for routine reversal of moderate rocuronium-induced neuromuscular blockade<sup>1</sup>**

#### Important safety information

BRIDION is not recommended in patients with severe renal impairment. Studies in patients with hepatic impairment have not been conducted and, therefore, patients with severe hepatic impairment should be treated with great caution. Caution should be exercised when administering BRIDION to pregnant women as no clinical data on exposed pregnancies are available.

BRIDION has not been investigated in patients receiving rocuronium or vecuronium in the Intensive Care Unit (ICU) setting.

If neuromuscular blockade is required within 24 hours of BRIDION administration, a nonsteroidal neuromuscular blocking agent should be used instead of rocuronium or vecuronium. The most commonly reported adverse reactions were dysgeusia (metal or bitter taste) and anesthetic complications (movement, coughing, grimacing, or suckling on the endotracheal tube). In patients treated with BRIDION, a few cases of awareness were reported. The relation to BRIDION was uncertain. In a few individuals, allergic-like reactions (ie, flushing, erythematous rash) following BRIDION were reported. Clinicians should be prepared for the possibility of allergic reactions and take the necessary precautions. In a trial of patients with a history of pulmonary complications, bronchospasm was reported in 2 patients and a causal relationship could not be fully excluded. Volunteer studies have demonstrated a slight (17%-22%) and transient (<30 minutes) prolongation of the prothrombin time/activated partial thromboplastin time (PT/aPTT) with BRIDION; however, clinical studies have demonstrated no clinically relevant effect on peri- or postoperative bleeding complications with BRIDION alone or in combination with anticoagulants. As BRIDION has demonstrated an in vitro pharmacodynamic interaction with anticoagulants, caution should be exercised in patients on anticoagulation for a pre-existing or comorbid condition. This pharmacodynamic interaction is not clinically relevant for patients receiving routine postoperative prophylactic anticoagulation. Although formal interaction studies have not been conducted, no drug interactions were observed in clinical trials. Preclinical data suggest that clinically significant drug interactions are unlikely with the possible exceptions of toremifene, fusidic acid, and hormonal contraceptives.

<sup>\*</sup> Train-of-four  
<sup>†</sup> Post tetanic counts  
<sup>‡</sup> Second twitch

REFERENCES: 1. BRIDION Summary of Product Characteristics (SPC). 2. Blobner M, Eriksson LI, Scholz J, Motsch J, Della Rocca G, Prins ME. Reversal of rocuronium-induced neuromuscular blockade with sugammadex compared with neostigmine during sevoflurane anaesthesia: results of a randomised, controlled trial. [published online ahead of print July 30, 2010]. *Eur J Anaesthesiol*. doi:10.1097/EJA.0b013e32833d5eb7. 3. Jones RK, Caldwell JE, Brill SJ, Soto RG. Reversal of profound rocuronium-induced blockade with sugammadex: a randomized comparison with neostigmine. *Anesthesiology*. 2008;109(5):816-824.

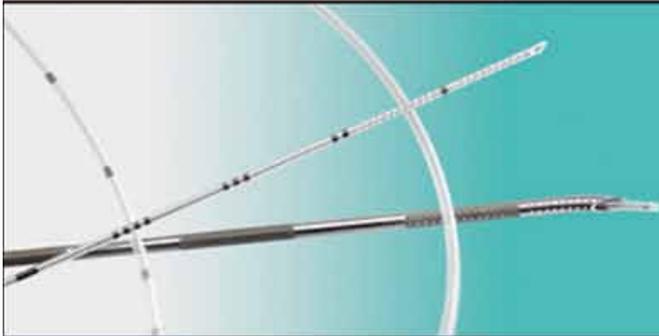
Please see summary of product characteristics for full prescribing information.



Copyright © 2010 Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA. All rights reserved. 05-2013-BRID-2011-LEVANT-1196-J

**PAJUNK®**

Pioneering Medical Tehnology



**TAP Block And InfiltraLong**  
For Effective Treatment  
Of Long And Deep Incisions

### **Sono Cannulas**

For Single Shot UltraSound  
Guided Nerve Blocks



### **SonoSystem And SonoLong Curl**

For UltraSound Guided Nerve Blocks



### **Sprotte® 2.G**

The New Generation  
Dura Puncture In Minimum Time



### **SonoEye Ophtalmic Block**

For Peribulbar And Retrobulbar  
Blocks Under Ultrasonic Monitoring



LMA™  
Better by Design

Question.

Your patient requires urgent pain medication. How can you administer this less invasively?

Answer.



LMA™  
Better by Design

LMA MAD Nasal™  
Needle-free intranasal drug delivery device

Atomization spray

The spray atomizes drugs into a fine mist of particles 30-100 microns in size.<sup>1</sup>

Soft conical plug

The plug forms a seal with the nostril preventing expulsion of fluid.

Malleable stylet

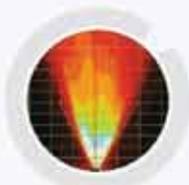
The malleable stylet allows 180° positioning of the nasal plug.

Accurate dosing

The syringe enables the accurate measurement of drugs to be delivered

Pressure

High applied pressure ensures that drugs are atomized into a fine mist of particles through the tip of the plug.



Spray geometry

Spray cone with a wide 62.75° average spray angle and a 36.9mm average plume width.<sup>2</sup>



References:

1. Talon M. et al., J Burn Care Research 2009; 30: 599-605.
2. MAD (Mucosal Atomization Device) Medical Atomizer In Vitro Spray Characterization, 2011



**It's like flying business class  
and paying coach fare.**



In an uncertain world where perioperative care is increasingly complex, uptime is critical. GE's anesthesia portfolio is known for dependable quality and a commitment to reliable performance that helps reduce operational costs long after the point of purchase. Today, GE Healthcare is changing the game and redefining affordable performance for the masses. No compromises. No boundaries.

Carestation 600 Series...It's all within reach.

[gehealthcare.com](http://gehealthcare.com)

© 2015 General Electric Company - All rights reserved.  
GE and GE Monogram are trademarks of General Electric Company.  
JB28064XX

Exclusive Dealer

**C.M.M.** S.A.R.L.  
SUPPLIES & SERVICES

[www.cmm\\_lb.com](http://www.cmm_lb.com)

Vanlian Center, Fuad Chehab Ave. Sin El Fil, Beirut, Lebanon

P.O.Box: 166804 T:+961 (0)1 512 820 +961 (0)1 512 821

M:+961 70 101 740 F:+961 (0)1 512 822