

2022 American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway: Supplement 3 - Bibliography by Section

1. EVALUATION OF THE AIRWAY

Risk prediction (for difficult airway or aspiration) obtained from history/medical records: *Demographic and Clinical Conditions (e.g., age, sex, BMI, previous difficult airway, diabetes, obesity)*

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Ahmadi K, Ebrahimi M, Hashemian AM, Sarshar S, Rahimi-Movaghar V: GlideScope video laryngoscope for difficult intubation in emergency patients: A quasi-randomized controlled trial. *Acta Med Iran* 2015; 53:738-42
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6. Chhina AK, Jain R, Gautam PL, Garg J, Singh N, Grewal A: Formulation of a multivariate predictive model for difficult intubation: A double blinded prospective study. *J Anaesthesiol Clin Pharmacol* 2018; 34:62-7
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14. Ferrari LR, Bedford RF: General anesthesia prior to treatment of anterior mediastinal masses in pediatric cancer patients. *Anesthesiology* 1990; 72:991-5

15. Frawley G, Espenell A, Howe P, Shand J, Heggie A: Anesthetic implications of infants with mandibular hypoplasia treated with mandibular distraction osteogenesis. *Paediatr Anaesth* 2013; 23:342-8
16. Graciano AL, Tamburro R, Thompson AE, Fiadjoe J, Nadkarni VM, Nishisaki A: Incidence and associated factors of difficult tracheal intubations in pediatric ICUs: a report from National Emergency Airway Registry for Children: NEAR4KIDS. *Intensive Care Med* 2014; 40:1659-69
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- laryngoscopy in apparently normal patients. *J Anaesthesiol Clin Pharmacol* 2013; 29:191-5
51. Sheff SR, May MC, Carlisle SE, Kallies KJ, Mathiason MA, Kothari SN: Predictors of a difficult intubation in the bariatric patient: Does preoperative body mass index matter? *Surg Obes Relat Dis* 2013; 9:344-9
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(Case reports)

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Diagnostic test findings from medical records (e.g., radiography, computed tomography, magnetic resonance imaging, bedside endoscopy findings)

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Grimes D, Macleod I, Taylor T, O'Connor M, Sidebottom A: Computed tomography as an aid to planning intubation in the difficult airway. *Br J Oral Maxillofac Surg* 2016; 54:80-2
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(Case reports)

3. Kawai T, Shimozato K, Ochiai S: Elongated styloid process as a cause of difficult intubation. *J Oral Maxillofac Surg* 1990; 48:1225-8
4. Lyons G: Failed intubation. Six years' experience in a teaching maternity unit. *Anaesthesia* 1985; 40:759-62
5. Pollard BA, El-Beheiry H: Pott's disease with unstable cervical spine, retropharyngeal cold abscess and progressive airway obstruction. *Can J Anaesth* 1999; 46:772-5

Patient interview/questionnaires

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Acar HV, Uysal HY, CeyhanKaya A, Ceyhan A, Dikmen B: Does the STOP-Bang, an obstructive sleep apnea screening tool, predict difficult intubation? *Eur Rev Med Pharmacol Sci* 2014; 18:1869-74
2. Mathangi K, Mathews J, Mathangi CD: Assessment of perioperative difficult airway among undiagnosed obstructive sleep apnoea patients undergoing elective surgery: A prospective cohort study. *Indian J Anaesth* 2018; 62:538-44
3. Toshniwal G, McKelvey GM, Wang H: STOP-Bang and prediction of difficult airway in obese patients. *J Clin Anesth* 2014; 26:360-7

Airway assessment/exam (bedside and advanced) when a difficult airway is known or suspected

Assessment of facial features (e.g., mouth opening, nose slope, neck slope, ratio of brow to nose to chin, full beard)

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Badheka J, Doshi P, Vyas A, Kacha N, Parmar V: Comparison of upper lip bite test and ratio of height to thyromental distance with other airway assessment tests for predicting difficult endotracheal intubation. *Indian J Crit Care Med* 2016; 20:3-8
2. Brodsky JB, Lemmens HJ, Brock-Utne JG, Vierra M, Saidman LJ: Morbid obesity and tracheal intubation. *Anesth Analg* 2002; 94:732-6
3. Butler PJ, Dhara SS: Prediction of difficult laryngoscopy: an assessment of the thyromental distance and Mallampati predictive tests. *Anaesth Intensive Care* 1992; 20:139-42
4. Cattano D, Killoran PV, Cai C, Katsiampoura AD, Corso RM, Hagberg CA: Difficult mask ventilation in general surgical population: Observation of risk factors and predictors. *F1000Res* 2014; 3
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Upper lip bite test

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

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Observational studies, case reports, or non-pertinent comparison groups

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Imaging (ultrasound)

Observational studies, case reports, or non-pertinent comparison groups (measurements obtained by ultrasound)

(Observational data)

1. Abdelhady BS, Elrabiey MA, Abd Elrahman AH, Mohamed EE: Ultrasonography versus conventional methods (Mallampati score and thyromental distance) for prediction of difficult airway in adult patients. *Egypt J Anaesth* 2020; 36:83-9
2. Abraham S, Himarani J, Mary Nancy S, Shanmugasundaram S, Krishnakumar Raja VB: Ultrasound as an assessment method in predicting difficult intubation: A prospective clinical study. *J Maxillofac Oral Surg* 2018; 17:563-9

3. Alessandri F, Antenucci G, Piervincenzi E, Buonopane C, Bellucci R, Andreoli C, Alunni Fegatelli D, Ranieri MV, Bilotta F: Ultrasound as a new tool in the assessment of airway difficulties: An observational study. *Eur J Anaesthesiol* 2019; 36:509-15
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6. Falcetta S, Cavallo S, Gabbanelli V, Pelaia P, Sorbello M, Zdravkovic I, Donati A: Evaluation of two neck ultrasound measurements as predictors of difficult direct laryngoscopy: A prospective observational study. *Eur J Anaesthesiol* 2018; 35:605-12
7. Fulkerson JS, Moore HM, Lowe RF, Anderson TS, Lucas LL, Reed JW: Airway sonography fails to detect difficult laryngoscopy in an adult Veteran surgical population. *Trends Anaesth Crit Care* 2019; 29:26-34
8. Koundal V, Rana S, Thakur R, Chauhan V, Ekke S, Kumar M: The usefulness of point of care ultrasound (POCUS) in preanaesthetic airway assessment. *Indian J Anaesth* 2019; 63:1022-8
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10. Ni H, Guan C, He G, Bao Y, Shi D, Zhu Y: Ultrasound measurement of laryngeal structures in the parasagittal plane for the prediction of difficult laryngoscopies in Chinese adults. *BMC Anesthesiol* 2020; 20
11. Parameswari A, Govind M, Vakamudi M: Correlation between preoperative ultrasonographic airway assessment and laryngoscopic view in adult patients: A prospective study. *J Anaesthesiol Clin Pharmacol* 2017; 33:353-8
12. Pinto J, Cordeiro L, Pereira C, Gama R, Fernandes HL, Assuncao J: Predicting difficult laryngoscopy using ultrasound measurement of distance from skin to epiglottis. *J Crit Care* 2016; 33:26-31
13. Rana S, Verma V, Bhandari S, Sharma S, Koundal V, Chaudhary SK: Point-of-care ultrasound in the airway assessment: A correlation of ultrasonography-guided parameters to the Cormack-Lehane Classification. *Saudi J Anaesth* 2018; 12:292-6
14. Reddy PB, Punetha P, Chalam KS: Ultrasonography - A viable tool for airway assessment. *Indian J Anaesth* 2016; 60:807-13
15. Wojtczak JA: Submandibular sonography: assessment of hyomental distances and ratio, tongue size, and floor of the mouth musculature using portable sonography. *J Ultrasound Med* 2012; 31:523-8
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17. Yilmaz C, Karasu D, Dilektasli E, Taha A, Ozgunay SE, Korfali G: An evaluation of ultrasound measurements of anterior neck soft tissue and other predictors of difficult laryngoscopy in morbidly obese patients. *Bariatr Surg Pract Patient Care* 2018; 13:18-24

(Case reports)

18. Adi O, Fong CP, Sum KM, Ahmad AH: Usage of airway ultrasound as an assessment and prediction tool of a difficult airway management. *Am J Emerg Med* 2020
19. Shih CC, Wang JC, Chen SJ, Hsu YP: Focused ultrasound assists in diagnosis and management of difficult airway in Ludwig's angina. *J Med Ultrasound* 2019; 27:61-62

Virtual laryngoscopy/bronchoscopy (MRI/CT reconstruction)

Observational studies, case reports, or non-pertinent comparison groups

NO ENTRIES

Bedside endoscopy (direct laryngoscopy, bronchoscopy, nasopharyngoscopy)

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Gemma M, Buratti L, Di Santo D, Calvi MR, Ravizza A, Bondi S, Bussi M, Beretta L: Pre-operative transnasal endoscopy as a predictor of difficult airway: A prospective cohort study. *Eur J Anaesthesiol* 2020; 37:98-104
2. Rosenblatt W, Ianus AI, Sukhupragarn W, Fickenscher A, Sasaki C: Preoperative endoscopic airway examination (PEAE) provides superior airway information and may reduce the use of unnecessary awake intubation. *Anesth Analg* 2011; 112:602-7

(Case report)

3. Zhang X, Li W: Misguidance of peroral rigid laryngoscopy in assessment of difficult airway: two comparable cases in microlaryngeal surgery. *BMJ Case Reports* 2013; 22:22

2. PREPARATION FOR DIFFICULT AIRWAY MANAGEMENT

Patient positioning (e.g., sniffing, sitting, head/neck extension, head-elevated laryngoscopy [HELP], ramped)

(Observational data)

1. Lee JH, Jung HC, Shim JH, Lee C: Comparison of the rate of successful endotracheal intubation between the "sniffing" and "ramped" positions in patients with an expected difficult intubation: a prospective randomized study. *Korean J Anesthesiol* 2015; 68:116-21
2. Schmitt HJ, Mang H: Head and neck elevation beyond the sniffing position improves laryngeal view in cases of difficult direct laryngoscopy. *J Clin Anesth* 2002; 14:335-8

3. ANTICIPATED DIFFICULT AIRWAY MANAGEMENT

Awake tracheal intubation (any device)

Awake/sedated intubation versus intubation after induction (direct laryngoscopy or blind intubation)

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

1. Dimitriou VK, Zogogiannis ID, Liotiri DG: Awake tracheal intubation using the Airtraq laryngoscope: a case series. *Acta Anaesthesiol Scand* 2009; 53:964-7
1. Kezo A, Patel RD, Mathkar S, Butada S: Use of a Macintosh blade in extrahepatic portal vein obstruction with difficult intubation: two case reports. *J Med Case Rep* 2016; 10:245
2. Redden RL, Biery KA, Campbell RL: Arterial oxygen desaturation during awake endotracheal intubation. *Anesth Prog* 1990; 37:201-4

Both awake and anesthetized intubation

Airway maneuvers (e.g., jaw thrust chin lift, external laryngeal manipulation, backwards/upwards/rightwards pressure)

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

1. Indiveri L, Mohamed AN, Milner A: Branchio-otic syndrome: An opportunity to reassess the paediatric anaesthetists' approach to the difficult syndromic airway. South Afr J Anaesth Analg 2019; 25:27-30
2. Saxena KN, Bansal P: Endotracheal intubation under local anesthesia and sedation in an infant with difficult airway. J Anaesthesiol Clin Pharmacol 2012; 28:358-60
3. Tungaria H, Raiger LK, Paliwal R, Saxena SS, Bairwa BK: Palatonasal fistula repair - A case of unanticipated difficult intubation. J Clin Diagn Res 2016; 10:UD01-02

Rigid laryngoscopic blades of alternative design and size, with adequate face mask ventilation after induction (alternatives to standard blades such as Macintosh, Miller)

Randomized controlled trials: modified blades versus standard blades

1. Beilin B, Yardeni IZ, Smolyarenko V, Zeidel A, Ram E, Mayburd E: Comparison of the Flexiblade levering laryngoscope with the English Macintosh laryngoscope in patients with a poor laryngoscopic view. Anaesthesia 2005; 60:400-5

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

1. Aoyama K, Nagaoka E, Takenaka I, Kadoya T: The McCoy laryngoscope expands the laryngeal aperture in patients with difficult intubation. Anesthesiology 2000; 92:1855-6
2. Asai T, Matsumoto S, Shingu K: Use of the McCoy laryngoscope or fingers to facilitate fibrescope-aided tracheal intubation. Anaesthesia 1998; 53:903-5
3. Chisholm DG, Calder I: Experience with the McCoy laryngoscope in difficult laryngoscopy. Anaesthesia 1997; 52:906-908
4. Leary JA: Mechanical failure of the McCoy laryngoscope during a difficult intubation. Anaesthesia 2001; 56:88-9
5. Usui T, Saito S, Goto F: Arytenoid dislocation while using a McCoy laryngoscope. Anesth Analg 2001; 92:1347-8

Adjuncts – introducers, bougies, stylets, alternative endotracheal tubes

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Krafft P, Fitzgerald R, Pernerstorfer T, Kapral S, Weinstabl C: A new device for blind oral intubation in routine and difficult airway management. Eur J Anaesthesiol 1994; 11:207-12
2. Rao TL, Mathru M, Gorski DW, Salem MR: Experience with a new intubation guide for difficult tracheal intubation. Crit Care Med 1982; 10:882-3

- Winterhalter M, Kirchhoff K, Groschel W, Lullwitz E, Heermann R, Hoy L, Heine J, Hagberg C, Piepenbrock S: The laryngeal tube for difficult airway management: a prospective investigation in patients with pharyngeal and laryngeal tumours. *Eur J Anaesthesiol* 2005; 22:678-82

(Case reports)

- Abrons RO, Vansickle RA, Ouanes JP: Seldinger technique for nasal intubation: a case series. *J Clin Anesth* 2016; 34:609-11
- Kaur J, Swami AC, Kumar A, Lata S: Anesthetic management of a child with Hunter's syndrome. *J Anaesthesiol Clin Pharmacol* 2012; 28:255-7
- Kovac AL: Use of the Augustine stylet anticipating difficult tracheal intubation in Treacher-Collins syndrome. *J Clin Anesth* 1992; 4:409-12
- Packiasabapathy S, Chandiran R, Batra RK, Agarwala S: Difficult airway in Mowat-Wilson syndrome. *J Clin Anesth* 2016; 34:151-3
- Pande A, Ramachandran R, Rewari V: Bougie-associated bronchial injury complicated by a nephropleural fistula after percutaneous nephrolithotomy: A tale of two complications. *BMJ Case Rep* 2018; 2018:17
- Pius J, Ioanidis K, Noppens RR: Use of the novel C-MAC video stylet in a case of predicted difficult intubation: A case report. *A A Pract* 2019

Video/video-assisted laryngoscopy

Randomized controlled trials: video/video-assisted laryngoscopy versus direct laryngoscopy

- Ali QE, Amir SH, Ahmed S: A comparative evaluation of King Vision video laryngoscope (channelled blade), McCoy, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine. *Sri Lankan J Anaesthesiol* 2017; 25:70
- Aziz MF, Dillman D, Fu R, Brambrink AM: Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway. *Anesthesiology* 2012; 116:629-36
- Cordovani D, Russell T, Wee W, Suen A, Cooper RM: Measurement of forces applied using a Macintosh direct laryngoscope compared with a Glidescope video laryngoscope in patients with predictors of difficult laryngoscopy: A randomised controlled trial. *Eur J Anaesthesiol* 2019; 36:221-6
- Gupta N, Rath GP, Prabhakar H: Clinical evaluation of C-MAC videolaryngoscope with or without use of stylet for endotracheal intubation in patients with cervical spine immobilization. *J Anesth* 2013; 27:663-70
- Hazarika H, Saxena A, Meshram P, Kumar Bhargava A: A randomized controlled trial comparing C Mac D Blade and Macintosh laryngoscope for nasotracheal intubation in patients undergoing surgeries for head and neck cancer. *Saudi J Anaesth* 2018; 12:35-41
- Jungbauer A, Schumann M, Brunkhorst V, Borgers A, Groeben H: Expected difficult tracheal intubation: a prospective comparison of direct laryngoscopy and video laryngoscopy in 200 patients. *Br J Anaesth* 2009; 102:546-50
- Karsli C, Armstrong J, John J: A comparison between the GlideScope video laryngoscope and direct laryngoscope in paediatric patients with difficult airways - a pilot study. *Anaesthesia* 2010; 65:353-357
- Liu L, Yue H, Li J: Comparison of three tracheal intubation techniques in thyroid tumor patients with a difficult airway: A randomized controlled trial. *Med Princ Pract* 2014; 23:448-52
- Malik MA, Subramaniam R, Maharaj CH, Harte BH, Laffey JG: Randomized controlled trial of the Pentax AWS, Glidescope, and Macintosh laryngoscopes in predicted difficult intubation. *Br J Anaesth* 2009; 103:761-8

10. Okumura Y, Okuda M, Sato Boku A, Tachi N, Hashimoto M, Yamada T, Yamada M: Usefulness of Airway Scope for intubation of infants with cleft lip and palate-comparison with Macintosh laryngoscope: a randomized controlled trial. *BMC Anesthesiol* 2019; 19
11. Pappu A, Sharma B, Jain R, Dua N, Sood J: A randomised comparative study of 'videoendoscope' with the Truview EVO2, C-MAC D blade videolaryngoscope and the Macintosh laryngoscope. *Indian J Anaesth* 2020; 64:S186-92
12. Serocki G, Bein B, Scholz J, Dörge V: Management of the predicted difficult airway: A comparison of conventional blade laryngoscopy with video-assisted blade laryngoscopy and the GlideScope. *Eur J Anaesthesiol* 2010; 27:24-30
13. Serocki G, Neumann T, Scharf E, Dörge V, Cavus E: Indirect videolaryngoscopy with C-MAC D-Blade and GlideScope: a randomized, controlled comparison in patients with suspected difficult airways. *Minerva Anesthesiol* 2013; 79:121-9
14. Zhu H, Liu J, Suo L, Zhou C, Sun Y, Jiang H: A randomized controlled comparison of non-channeled king vision, McGrath MAC video laryngoscope and Macintosh direct laryngoscope for nasotracheal intubation in patients with predicted difficult intubations. *BMC Anesthesiol* 2019; 19

Nonrandomized comparative studies: video/video-assisted laryngoscopy versus direct laryngoscopy

1. Amaniti A, Papakonstantinou P, Gkinas D, Dalakakis I, Papapostolou E, Nikopoulou A, Tsatali M, Zarogoulidis P, Sapalidis K, Kosmidis C, Koulouris C, Giannakidis D, Romanidis K, Oikonomou P, Michalopoulos N, Ioannidis A, Tsakiridis K, Vagionas A, Kesisoglou I, Grosomanidis V: Comparison of laryngoscopic views between C-MAC TM and conventional laryngoscopy in patients with multiple preoperative prognostic criteria of difficult intubation: An observational cross-sectional study. *Medicina* 2019; 55:27
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Randomized controlled trials: video/video-assisted laryngoscopy versus flexible intubation scopes

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Randomized controlled trials: channel-guided (e.g., Airtraq, Kingvision, Pentax) versus non-channel-guided (e.g., Glidescope, C-MAC, McGrath)

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Randomized controlled trials: hyperangulated devices versus nonangulated devices

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Observational studies, case reports, or non-pertinent comparison groups: video/video-assisted laryngoscopy

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Optical laryngoscopes

Randomized controlled trials: video/video-assisted laryngoscopy versus direct laryngoscopy

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Observational studies, case reports, or non-pertinent comparison groups: optical laryngoscopes

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Flexible intubation scopes

Flexible fiberoptic-guided intubation vs laryngoscopic intubation

Nonrandomized comparative studies

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Observational studies, case reports, or non-pertinent comparison groups; fiberoptic intubation

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Supraglottic airway

Standard supraglottic airway (SGA, SAD, SGD, EGD, LMA)

Intubation with SGA versus intubation without SGA

Randomized controlled trials

1. Bhatnagar S, Mishra S, Jha RR, Singhal AK, Bhatnagar N: The LMA Fastrach facilitates fiberoptic intubation in oral cancer patients. *Can J Anaesth* 2005; 52:641-5
2. Hanna SF, Mikat-Stevens M, Loo J, Uppal R, Jellish WS, Adams M: Awake tracheal intubation in anticipated difficult airways: LMA Fastrach vs flexible bronchoscope: A pilot study. *J Clin Anesth* 2017; 37:31-7
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4. Shyam R, Chaudhary AK, Sachan P, Singh PK, Singh GP, Bhatia VK, Chandra G, Singh D: Evaluation of Fastrach laryngeal mask airway as an alternative to fiberoptic bronchoscope to manage difficult airway: a comparative study. *J Clin Diagn Res* 2017; 11:UC09-12

Intubating techniques with SGA (i.e., direct laryngoscopy, fiberoptic intubation, optical/image-guided intubation)

Observational studies, case reports, or non-pertinent comparison groups: SGA insertion, ventilation and intubation

(Observational data)

1. Arevalo-Ludena J, Arcas-Bellas JJ, Alvarez-Rementeria R, Alameda LE: Fiberoptic-guided intubation after insertion of the i-gel airway device in spontaneously breathing patients with difficult airway predicted: a prospective observational study. *J Clin Anesth* 2016; 35:287-92
2. Asai T, Shingu K: Tracheal intubation through the intubating laryngeal mask in patients with unstable necks. *Acta Anaesthesiol Scand* 2001; 45:818-22
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(Case reports)

14. Ads A, Auerbach F, Ryan K, El-Ganzouri AR: Air-Q laryngeal airway for rescue and tracheal intubation. *J Clin Anesth* 2016; 32:108-11
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37. Ludena JA, Bellas JJA, Alvarez-Rementeria R, Munoz LE: Fiberoptic-guided intubation after awake insertion of the I-gel™ supraglottic device in a patient with predicted difficult airway. *J Anaesthesiol Clin Pharmacol* 2017; 33:560-1
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Second versus first generation SGA: Second generation = ProSeal LMA, Supreme LMA, i-gel, SLIPA, and Laryngeal Tube Suction-D); First generation = LMA Classic, ILMA Classic, LMA Classic (Teleflex), ILMA Classic (Teleflex)

Randomized controlled trials

1. Michálek P, Donaldson W, McAleavey F, Abraham A, Mathers RJ, Telford C: The i-gel supraglottic airway as a conduit for fibreoptic tracheal intubation - A randomized comparison with the single-use intubating laryngeal mask airway and Ctrach laryngeal mask in patients with predicted difficult laryngoscopy. *Prague Med Rep* 2016; 117:164-75
2. Singh J, Yadav MK, Marahatta SB, Lal Shrestha B: Randomized crossover comparison of the laryngeal mask airway classic with i-gel laryngeal mask airway in the management of difficult airway in post burn neck contracture patients. *Indian J Anaesth* 2012; 56:348-52

Lighted stylet, light wand, or optical stylet

Lighted stylet, light wand, or optical stylet vs blind intubation

Randomized controlled trials

1. Dong Y, Li G, Wu W, Su R, Shao Y: Lightwand-guided nasotracheal intubation in oromaxillofacial surgery patients with anticipated difficult airways: a comparison with blind nasal intubation. *Int J Oral Maxillofac Surg* 2013; 42:1049-53

Lighted stylet, light wand, or optical stylet vs laryngoscopic intubation

Randomized controlled trials

(Versus direct laryngoscopy)

1. Liu L, Yue H, Li J: Comparison of three tracheal intubation techniques in thyroid tumor patients with a difficult airway: A randomized controlled trial. *Med Princ Pract* 2014; 23:448-52
2. Rhee KY, Lee JR, Kim J, Park S, Kwon WK, Han S: A comparison of lighted stylet (Surch-Lite) and direct laryngoscopic intubation in patients with high Mallampati scores. *Anesth Analg* 2009; 108:1215-9

(Versus Flexible bronchoscope)

3. Cheng T, Wang LK, Wu HY, Yang XD, Zhang X, Jiao L: Shikani optical stylet for awake nasal intubation in patients undergoing head and neck surgery. *Laryngoscope* 2021; 131:319-25
4. Mahrous RSS, Ahmed AMM: The Shikani Optical Stylet as an alternative to awake fiberoptic intubation in patients at risk of secondary cervical spine injury: A randomized controlled trial. *J Neurosurg Anesthesiol* 2018; 30:354-8

Observational studies, case reports, or non-pertinent comparison groups: lighted stylet, light wand, or optical stylet

(Observational data)

1. Bamgbade OA: The use of intubating lightwand in difficult airway patients with limited management options. *Niger Postgrad Med J* 2017; 24:187-90
2. Holzman RS, Nargoizian CD, Florence FB: Lightwand intubation in children with abnormal upper airways. *Anesthesiology* 1988; 69:784-7
3. Hung OR, Pytka S, Morris I, Murphy M, Stewart RD: Lightwand intubation: II--Clinical trial of a new lightwand for tracheal intubation in patients with difficult airways. *Can J Anaesth* 1995; 42:826-30
4. Subhash, Dhama VK, Manik YK, Tiwari T, Singh G: Use of lightwand for nasotracheal intubation in adult patients with limited mouth opening undergoing elective surgery. *Anaesth Pain Intensive Care* 2015; 19:468-72
5. Yang D, Tong SY, Jin JH, Tang GZ, Sui JH, Wei LX, Deng XM: Shikani optical stylet-guided intubation via the intubating laryngeal airway in patients with scar contracture of the face and neck. *Chin Med Sci J* 2013; 28:195-200

(Case reports)

6. Agrò F, Totonelli A, Gherardi S: Planned lightwand intubation in a patient with a known difficult airway. *Can J Anaesth* 2004; 51:1051-2
7. Gaszynska E, Wieczorek A, Gaszynski T: Awake endotracheal intubation in patients with severely restricted mouth opening- alternative devices to fiberscope: Series of cases and literature review. *Cent Eur J Med* 2014; 9:768-72
8. Jain M, Gupta A, Garg M, Rastogi B, Chauhan H: Innovative lighted stylet--succeeds where conventional lighted stylet fails. *Middle East J Anaesthesiol* 2009; 20:447-50
9. Jeong H, Chae M, Seo H, Yi JW, Kang JM, Lee BJ: Face-to-face intubation using a lightwand in a patient with severe thoracolumbar kyphosis: a case report. *BMC Anesthesiol* 2018; 18:92
10. Kovacs G, Law AJ, Petrie D: Awake fiberoptic intubation using an optical stylet in an anticipated difficult airway. *Ann Emerg Med* 2007; 49:81-3
11. Shukry M, Hanson RD, Koveleskie JR, Ramadhyani U: Management of the difficult pediatric airway with Shikani optical stylet. *Paediatr Anaesth* 2005; 15:342-5
12. Stone DJ, Stirt JA, Kaplan MJ, McLean WC: A complication of lightwand-guided nasotracheal intubation. *Anesthesiology* 1984; 61:780-1
13. Uakritdathikarn T: Lightwand-assisted nasotracheal intubation in awake ankylosing spondylitis. *J Med Assoc Thai* 2006; 89:1976-80
14. Xue FS, Yang QY, Liao X, He N, Liu HP: Lightwand guided intubation in paediatric patients with a known difficult airway: a report of four cases. *Anaesthesia* 2008; 63:520-5

Combination techniques

Randomized controlled trials: device combination versus single device

1. Mazzinari G, Rovira L, Henao L, Ortega J, Casasempere A, Fernandez Y, Acosta M, Belaouchi M, Esparza-Minana JM: Effect of dynamic versus stylet-guided intubation on first-attempt success in difficult airways undergoing glidescope laryngoscopy: A randomized controlled trial. *Anesth Analg* 2019; 128:1264-71
2. Wu CN, Ma WH, Wei JQ, Wei HF, Cen QY, Cai QX, Cao Y: Laryngoscope and a new tracheal tube assist lightwand intubation in difficult airways due to unstable cervical spine. *PLoS One* 2015; 10:e0120231

Observational studies, case reports, or non-pertinent comparison groups: combination techniques

(Observational data)

1. Khan MU: Endotracheal intubation in patients with unstable cervical spine using LMA-Fastrach and gum elastic bogie. *J Coll Physicians Surg Pak* 2014; 24:4-7
2. Kihara S, Watanabe S, Brimacombe J, Taguchi N, Yaguchi Y, Yamasaki Y: Segmental cervical spine movement with the intubating laryngeal mask during manual in-line stabilization in patients with cervical pathology undergoing cervical spine surgery. *Anesth Analg* 2000; 91:195-200
3. Lenhardt R, Burkhart MT, Brock GN, Kanchi-Kandadai S, Sharma R, Akca O: Is video laryngoscope-assisted flexible tracheoscope intubation feasible for patients with predicted difficult airway? A prospective, randomized clinical trial. *Anesth Analg* 2014; 118:1259-65
4. Modir H, Moshiri E, Malekianzadeh B, Noori G, Mohammadbeigi A: Endotracheal intubation in patients with difficult airway: Using laryngeal mask airway with bougie versus video laryngoscopy. *Med Gas Resch* 2017; 7:150-155
5. Mort TC, Braffett BH: Conventional versus video laryngoscopy for tracheal tube exchange: glottic visualization, success rates, complications, and rescue alternatives in the high-risk difficult airway patient. *Anesth Analg* 2015; 121:440-8

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7. Pieters BM, Theunissen M, van Zundert AA: Macintosh blade videolaryngoscopy combined with rigid bonfils intubation endoscope offers a suitable alternative for patients with difficult airways. *Anesth Analg* 2018; 126:988-994
8. Rogers SN, Benumof JL: New and easy techniques for fiberoptic endoscopy-aided tracheal intubation. *Anesthesiology* 1983; 59:569-72
9. Shigematsu T, Miyazawa N, Kobayashi M, Yorozu T, Toyoda Y, Morisaki H: Nasal intubation with Bullard laryngoscope: a useful approach for difficult airways. *Anesth Analg* 1994; 79:132-135
10. Van Zundert TCRV, Wong DT, Van Zundert AAJ: The LMA-Supreme™ as an intubation conduit in patients with known difficult airways: A prospective evaluation study. *Acta Anaesthesiol Scand* 2013; 57:77-81

(Case reports)

1. Choi EK, Kim JE, Soh SR, Kim CK, Park WK: Usefulness of a Cook(R) airway exchange catheter in laryngeal mask airway-guided fiberoptic intubation in a neonate with Pierre Robin syndrome -A case report. *Korean J Anesthesiol* 2013; 64:168-71
2. Chung MY, Park B, Seo J, Kim CJ: Successful airway management with combined use of McGrath((R)) MAC video laryngoscope and fiberoptic bronchoscope in a severe obese patient with huge goiter -a case report. *Korean J Anesthesiol* 2018; 71:232-6
3. Ciccozzi A, Angeletti C, Guetti C, Papola R, Angeletti PM, Paladini A, Varrassi G, Marinangeli F: GlideScope and Frova introducer for difficult airway management. *Case Rep Anesthesiol* 2013; 2013:717928
4. Correll LR, Jin C, Park MS, Webber AM: Urgent complex intraoperative reintubation in a known difficult airway after endotracheal tube damage: A case report. *A A Pract* 2019; 13:4-6
5. Curran C: Case report: Oropharyngeal injuries with Glidescope® usage in two obese patients. *Southern African Journal of Anaesthesia and Analgesia* 2015; 22:30–32
6. Ellard L, Brown DH, Wong DT: Extubation of a difficult airway after thyroidectomy: Use of a flexible bronchoscope via the LMA-Classical™. *Can J Anaesth* 2012; 59:53-7
7. Fitzmaurice BC, Lambert BG: Failed fiberoptic intubation in a child with epidermolysis bullosa, rescued with combined use of the Glidescope(R). *Paediatr Anaesth* 2016; 26:455-6
8. Furutani K, Kodera Y, Hiruma M, Ishii H, Baba H: Difficult tracheal intubation in a patient with maternal uniparental disomy 14. *JA Clin Rep* 2016; 2:25
9. Huang R-C, Hsu C-H, Chuang Y-S, Chan W-H, Wu Z-F, Cherng C-H, Kuo C-Y: Successful nasotracheal intubation in a patient with distorted airway anatomy by combined use of flexible fiberoptic bronchoscope and trachway. *J Med Sci* 2014; 34:95-7
10. Kanemaru H, Tsurumaki T, Kurata S, Tanaka Y, Yoshikawa H, Sato Y, Kodama Y, Suda A, Yamada Y, Seo K: Endotracheal intubation complicated by a palatal tooth in a patient with Treacher Collins Syndrome. *Anesth Prog* 2019; 66:42-3
11. Kim SM, Kim HJ: Successful advancement of endotracheal tube with combined fiberoptic bronchoscopy and videolaryngoscopy in a patient with a huge goiter. *SAGE Open Med Case Rep* 2020; 8
12. Kim Y, Kim JE, Jeong DH, Lee J: Combined use of a McGrath(R) MAC video laryngoscope and Frova Intubating Introducer in a patient with Pierre Robin syndrome: A case report. *Korean J Anesthesiol* 2014; 66:310-3
13. Liew GHC, Wong TGL, Lu A, Kothandan H: Combined use of the glidescope and flexible fibrescope as a rescue technique in a difficult airway. *Proceed Singapore Health* 2015; 24:117-20

14. Lim WY, Wong P: Awake supraglottic airway guided flexible bronchoscopic intubation in patients with anticipated difficult airways: A case series and narrative review. *Korean J Anesthesiol* 2019; 72:548-57
15. McCrerrick A, Pracilio JA: Awake intubation: A new technique. *Anaesthesia* 1991; 46:661-3
16. Moda N, Kumar N: Combined use of video laryngoscopy and fiberoptic for airway management in a patient with fixed cervical spine. *Asian J Pharma Clin Res* 2018; 11:1-3
17. Mukaihara K, Godai K, Yamada T, Hasegawa-Moriyama M, Kanmura Y: Successful airway management using a MultiViewScope handle with a stylet scope in a patient with Schwartz-Jampel syndrome. *JA Clin Rep* 2016; 2:36
18. Park CD, Lee HK, Yim JY, Kang IH: Anesthetic management for a patient with severe mento-sternal contracture: difficult airway and scarce venous access -A case report. *Korean J Anesthesiol* 2013; 64:61-4
19. Saruki N, Saito S, Sato J, Takahashi T, Tozawa R: Difficult airway management with the combination of a fibreoptic stylet and McCoy laryngoscope. *Can J Anaesth* 2001; 48:212
20. Sung JK, Kim HG, Kim JE, Jang MS, Kang JM: Endotracheal tube intubation with the aid of a laryngeal mask airway, a fiberoptic bronchoscope, and a tube exchanger in a difficult airway patient: a case report. *Korean J Anesthesiol* 2014; 66:237-9
21. Thompson NCP: Concurrent use of videolaryngoscope and fiberoptic bronchoscope in a child with neurofibromatosis to facilitate endotracheal intubation. *J Nat Med Assoc* 2020
22. Ul Haq MI, Shamim F, Lal S, Shafiq F: Airway management in a patient with severe ankylosing spondylitis causing bamboo spine: Use of Aintree intubation catheter. *J Coll Physicians Surg Pak* 2015; 25:900-2
23. Wong DT, Woo JA, Arora G: Lighted stylet-guided intubation via the intubating laryngeal airway in a patient with Hallermann-Streiff syndrome. *Can J Anaesth* 2009; 56:147-150
24. Yadav SS, Gupta S, Choudhary B: Smaller size laryngeal mask airway and gum elastic bougie combination is a failsafe technique for tracheal intubation in a child with temporomandibular joint ankylosis. *J Evol Med Dent Sci* 2014; 3:12225-9

Retrograde wire-guided intubation

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

1. Bhola N, Jadhav A, Borle R, Khemka G, Ajani AA: Awake endotracheal retrograde intubation in restricted mouth opening: a 'J'-tipped guide wire technique--A retrospective study. *Oral Maxillofac Surg* 2014; 18:393-6
2. Çelik F, Tokgoz O, Dogan E, Guzel A, Ciftci T, Tufek A: Retrograde intubation in the patient with cystic tumor located at the base of tongue. *Middle East J Anaesthesiol* 2013; 22:333-6
3. Dey S, Ninu M, Yunus M, Syiemiong N: Fiberoptic guided retrograde intubation in an anticipated difficult airway: revival of an antiquated technique. *J Clin Diagn Res* 2016; 10:UD06-07
4. Krishna R, Shenoy TV, Goneppanavar U: Airway management in an infant with congenital trismus: The role of retrograde intubation. *South Afr J Anaesth Analg* 2012; 18:267-9
5. Takaishi K, Kawahito S, Tomioka S, Eguchi S, Kitahata H: Cuffed oropharyngeal airway for difficult airway management. *Anesth Prog* 2014; 61:107-10

Front of neck access (FONA) - cricothyrotomy (percutaneous), cricothyrotomy (surgical), tracheostomy, scalpel bougie technique or scalpel bougie tube technique versus needle cannula technique

Observational studies, case reports, or non-pertinent comparison groups

(Case report)

1. Gandhe RU, Bhave CP, Kakde AS, Sathe KA: Unanticipated difficulty in an anticipated difficult airway in the neurointervention suite: A case report. J Neuroanaesth Crit Care 2018; 5:190-2

4. UNANTICIPATED AND EMERGENCY DIFFICULT AIRWAY MANAGEMENT

Optimize oxygenation: Expiratory Ventilatory Assistance

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

1. Morrison S, Aerts S, Van Rompaey D, Vanderveken O: Failed awake intubation for critical airway obstruction rescued with the Ventrain device and an Arndt exchange catheter: A case report. A A Pract 2019; 13:23-6
2. Wahlen BM, Al-Thani H, El-Menyar A: Ventrain: from theory to practice. Bridging until re-tracheostomy. BMJ Case Rep 2017; 2017:16

Rigid laryngoscopic blades of alternative design and size, with adequate face mask ventilation after induction (alternatives to standard blades such as Macintosh, Miller)

Observational studies, case reports, or non-pertinent comparison groups

(Case series)

1. Sheeran P, Maguire T, Browne G: Mechanical failure of the McCoy laryngoscope during difficult intubation. Anaesthesia 2000; 55:184-55

Adjuncts – introducers, bougies, stylets, alternative endotracheal tubes

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

1. Driver BE, Prekker ME, Klein LR, Reardon RF, Miner JR, Fagerstrom ET, Cleghorn MR, McGill JW, Cole JB: Effect of use of a bougie vs endotracheal tube and stylet on first-attempt intubation success among patients with difficult airways undergoing emergency intubation: A randomized clinical trial. JAMA 2018; 319:2179-89

(Case reports)

2. Gaszynski T, Gaszynska E: The Clarus Video System stylet for awake intubation in a very difficult urgent intubation. Anaesthesiol Intensive Ther 2013; 45:153-4
3. Gupta N, Rath GP, Bala R, Reddy BK, Chaturvedi A: Anesthetic management in children with Hurler's syndrome undergoing emergency ventriculoperitoneal shunt surgery. Saudi J Anaesth 2012; 6:178-80
4. Hajjar WM, Alsubaie N, Nouh TA, Al-Nassar SA: Is it safe to use frova airway intubating device during tracheal intubation in difficult airway patient with multiple and chest trauma? Saudi J Anaesth 2016; 10:477-9

5. Hansda U, Agarwal J, Patra C, Ganjoo P: Extradural hematoma surgery in a child with Hutchinson-Gilford progeria syndrome: Perioperative concerns. *J Pediatr Neurosci* 2013; 8:165-7
6. Samra T, Banerjee N: Anaesthesia for emergency ventriculo-peritoneal shunt in an adolescent with Noonan's Syndrome. *Indian J Anaesth* 2014; 58:452-5
7. Sime J, Bailitz J, Moskoff J: The bougie: An inexpensive lifesaving airway device. *J Emerg Med* 2012; 43:e393-5
8. Strutt JR, Thompson NR, Stotesbery JL, Horvath B: Emergency endotracheal intubation with a rigid stylet of an infant with severe subglottic stenosis. *J Emerg Med* 2020; 58:e157-60
9. Subedi A, Tripathi M, Bhattarai B, Pokharel K, Dhital D: Successful intubation with McCoy laryngoscope in a patient with ankylosing spondylitis. *J Nepal Health Res Counc* 2014; 12:70-2
10. Yaman F, Arslan B, Yuvañç E, Büyükköçak U: Unexpected difficult airway with hypogonadotropic hypogonadism. *Int Med Case Rep J* 2014; 7:75-7

Video/video-assisted laryngoscopy

Nonrandomized comparative studies: video/video-assisted laryngoscopy versus direct laryngoscopy

1. Ahmadi K, Ebrahimi M, Hashemian AM, Sarshar S, Rahimi-Movaghar V: GlideScope video laryngoscope for difficult intubation in emergency patients: A quasi-randomized controlled trial. *Acta Med Iran* 2015; 53:738-42
2. Michailidou M, O'Keeffe T, Mosier JM, Friese RS, Joseph B, Rhee P, Sakles JC: A comparison of video laryngoscopy to direct laryngoscopy for the emergency intubation of trauma patients. *World J Surg* 2015; 39:782-8
3. Mosier JM, Stolz U, Chiu S, Sakles JC: Difficult airway management in the emergency department: GlideScope videolaryngoscopy compared to direct laryngoscopy. *J Emerg Med* 2012; 42:629-34

Observational studies, case reports, or non-pertinent comparison groups: video/video-assisted laryngoscopy

(Observational data)

1. Aziz MF, Brambrink AM, Healy DW, Willett AW, Shanks A, Tremper T, Jameson L, Ragheb J, Biggs DA, Paganelli WC, Rao J, Epps JL, Colquhoun DA, Bakke P, Kheterpal S: Success of intubation rescue techniques after failed direct laryngoscopy in adults: A retrospective comparative analysis from the multicenter perioperative outcomes group. *Anesthesiology* 2016; 125:656-66
2. Cavus E, Neumann T, Doerges V, Moeller T, Scharf E, Wagner K, Bein B, Serocki G: First clinical evaluation of the C-MAC D-Blade videolaryngoscope during routine and difficult intubation. *Anesth Analg* 2011; 112:382-5
3. Kilicaslan A, Topal A, Tavlan A, Erol A, Otelcioglu S: Effectiveness of the C-MAC video laryngoscope in the management of unexpected failed intubations. *Braz J Anesthesiol* 2014; 64:62-5
4. Noppens RR, Mobus S, Heid F, Schmidtman I, Werner C, Piepho T: Evaluation of the McGrath Series 5 videolaryngoscope after failed direct laryngoscopy. *Anaesthesia* 2010; 65:716-20

(Case reports)

1. Abbasijahromi A, Sanie Jahromi MS, Farzaneh M, Javadpour S, Montaseri MA, Kalani N: Success in difficult airway managements with video laryngoscope after two failures in Intubation with Macintosh and McCoy Laryngoscope: A case report. *Iran Red Cresc Med J* 2017; 19
2. Asai T: Pentax-AWS videolaryngoscope for awake nasal intubation in patients with unstable necks. *Br J Anaesth* 2010; 104:108-11
3. El-Tahan MR, Doyle DJ, Khidr AM, Abdulshafi M, Regal MA, Othman MS: Use of the King Vision video laryngoscope to facilitate fibreoptic intubation in critical tracheal stenosis proves superior to the GlideScope(R). *Can J Anaesth* 2014; 61:213-4
4. González-Giraldo D, Largo-Pineda CE, Zamudio-Burbano MA: Successful rescue with videolaryngoscopy after failed fibroscopy in anticipated difficult airway: Case series. *Colomb J Anesthesiol* 2020; 48:96-9
5. Gupta N, Pandia MP, Prabhakar H, Chauhan M: Video laryngoscopy added fiberoptic intubation in a patient with difficult airway. *J Anaesthesiol Clin Pharmacol* 2013; 29:283-4
6. Hariharan U, Shah SB, Naithani BK: Difficult intubation due to outgrowth between the epiglottic fold and the vocal cords: C-MAC™ to our rescue! *Sri Lankan J Anaesthesiol* 2015; 23

Flexible intubation scopes

Observational studies, case reports, or non-pertinent comparison groups; flexible fiberoptic intubation

(Observational data)

- 1 Aziz MF, Brambrink AM, Healy DW, Willett AW, Shanks A, Tremper T, Jameson L, Ragheb J, Biggs DA, Paganelli WC, Rao J, Epps JL, Colquhoun DA, Bakke P, Kheterpal S: Success of intubation rescue techniques after failed direct laryngoscopy in adults: A retrospective comparative analysis from the multicenter perioperative outcomes group. *Anesthesiology* 2016; 125:656-66

(Case reports)

- 2 Dalal RJ, Pai H, Pandya S: Difficult airway with HELLP syndrome. *Int J Infertil Fetal Med* 2012; 3:65-7
- 3 Huang L, Wang J, Chen S, Fang X: Study and reflection on anesthesia for tracheobronchopathia osteochondroplastica. *J Int Med Res* 2020; 48
- 4 Krishnan PL, Thiessen BH: Use of the Bonfils intubating fibrescope in a baby with a severely compromised airway. *Paediatr Anaesth* 2013; 23:670-2
- 5 Levin R, Kissoon N, Froese N: Fiberoptic and videoscopic indirect intubation techniques for intubation in children. *Pediatr Emerg Care* 2009; 25:473-9
- 6 Song JA, Bae HB, Choi JI, Kang J, Jeong S: Difficult intubation and anesthetic management in an adult patient with undiagnosed congenital tracheal stenosis: a case report. *J Int Med Res* 2020; 48
- 7 Takeshita S, Ueda H, Goto T, Muto D, Kakita H, Oshima K, Tainaka T, Ono T, Kazaoka Y, Yamada Y: Case report of Pierre Robin sequence with severe upper airway obstruction who was rescued by fiberoptic nasotracheal intubation. *BMC Anesthesiol* 2017; 17
- 8 Yun HJ, So E, Karm MH, Kim HJ, Seo KS: Orotracheal intubation in a patient with difficult airway by using fiberoptic nasotracheal intubation: A case report. *J Dent Anesth Pain Med* 2018; 18:125-8

Supraglottic airway (SGA, SAD, SGD, EGD, LMA)

Observational studies, case reports, or non-pertinent comparison groups: SGA insertion, ventilation and intubation

(Observational data)

- 1 Aziz MF, Brambrink AM, Healy DW, Willett AW, Shanks A, Tremper T, Jameson L, Ragheb J, Biggs DA, Paganelli WC, Rao J, Epps JL, Colquhoun DA, Bakke P, Kheterpal S: Success of intubation rescue techniques after failed direct laryngoscopy in adults: A retrospective comparative analysis from the multicenter perioperative outcomes group. *Anesthesiology* 2016; 125:656-66

(Case reports)

- 2 Cook TM, Brooks TS, Van der Westhuizen J, Clarke M: The Proseal LMA is a useful rescue device during failed rapid sequence intubation: two additional cases. *Can J Anaesth* 2005; 52:630-3
- 3 Fabregat-Lopez J: Successful pre-emptive emergency management of a compromised airway with a Proseal Laryngeal Mask Airway followed by tracheostomy. *Minerva Anestesiol* 2012; 78:619-21
- 4 Galderisi A, De Bernardo G, Lorenzon E, Trevisanuto D: i-gel: a new supraglottic device for effective resuscitation of a very low birthweight infant with Cornelia de Lange syndrome. *BMJ Case Reports* 2015; 25:25
- 5 Godley M, Reddy AR: Use of LMA for awake intubation for caesarean section. *Can J Anaesth* 1996; 43:299-302
- 6 Kalra S: Unanticipated difficult intubation in a child with Beals-Hecht syndrome presenting for emergency surgery. *Sri Lankan J Anaesthesiol* 2015; 23:27-8
- 7 Kannan S, Chestnutt N, McBride G: Intubating LMA guided awake fiberoptic intubation in severe maxillo-facial injury. *Can J Anaesth* 2000; 47:989-91
- 8 Lee KH, Kang ES, Jung JW, Park JH, Choi YG: Use of the i-gel supraglottic airway device in a patient with subglottic stenosis -a case report. *Korean J Anesthesiol* 2013; 65:254-6
- 9 Maxey-Jones CL, Palmerton A, Farmer JR, Bateman BT: Difficult airway management caused by local anesthetic allergy during emergent cesarean delivery: A case report. *A A Case Rep* 2017; 9:84-6
- 10 Palmer JH, Ball DR: Awake tracheal intubation with the intubating laryngeal mask in a patient with diffuse idiopathic skeletal hyperostosis. *Anaesthesia* 2000; 55:70-4
- 11 Parr MJ, Gregory M, Baskett PJ: The intubating laryngeal mask. Use in failed and difficult intubation. *Anaesthesia* 1998; 53:343-8
- 12 Pavoni V, Froio V, Nella A, Simonelli M, Gianesello L, Horton A, Malino L, Micaglio M: Tracheal intubation with Aura-i and aScope-2: How to minimize apnea time in an unpredicted difficult airway. *Case Rep Anesthesiol* 2015; 2015:453547
- 13 Portereiko JV, Perez MM, Hojman H, Frankel HL, Rabinovici R: Acute upper airway obstruction by an over-inflated Combitube esophageal obturator balloon. *J Trauma* 2006; 60:426-7
- 14 Preis C, Czerny C, Preis I, Zimpfer M: Variations in ILMA external diameters: another cause of device failure. *Can J Anaesth* 2000; 47:886-9
- 15 Preis CA, Hartmann T, Zimpfer M: Laryngeal mask airway facilitates awake fiberoptic intubation in a patient with severe oropharyngeal bleeding. *Anesth Analg* 1998; 87:728-9
- 16 Ravalia A, Goddard JM: The laryngeal mask and difficult tracheal intubation. *Anaesthesia* 1990; 45:168
- 17 Sarkar S, Jafra A, Mathew P: Emergency airway management in Pierre Robin Sequence, our nightmare experiences. *Trends Anaesth Crit Care* 2020
- 18 Siddiqui S, Seet E, Chan WY: The use of laryngeal mask airway Supreme™ in rescue airway situation in the critical care unit. *Singapore Med J* 2014; 55:e205-6

- 19 Watson NC, Hokanson M, Maltby JR, Todesco JM: The intubating laryngeal mask airway in failed fiberoptic intubation. *Can J Anaesth* 1999; 46:376-8

Lighted stylet, light wand, or optical stylet

Observational studies, case reports, or non-pertinent comparison groups: lighted stylet, light wand, or optical stylet

(Observational data)

- 1 Aziz MF, Brambrink AM, Healy DW, Willett AW, Shanks A, Tremper T, Jameson L, Ragheb J, Biggs DA, Paganelli WC, Rao J, Epps JL, Colquhoun DA, Bakke P, Kheterpal S: Success of intubation rescue techniques after failed direct laryngoscopy in adults: A retrospective comparative analysis from the multicenter perioperative outcomes group. *Anesthesiology* 2016; 125:656-66

(Case reports)

- 2 Jain A, Naithani M: Infant with unanticipated difficult airway - Trachlight to the rescue. *J Anaesthesiol Clin Pharmacol* 2012; 28:361-3
- 3 Ushiroda J, Inoue S, Egawa J, Kawano Y, Kawaguchi M, Furuya H: Life-threatening airway obstruction due to upper airway edema and marked neck swelling after labor and delivery. *Braz J Anesthesiol* 2013; 63:508-10

Rigid bronchoscope

(Case report)

- 1 Madan K, Shrestha P, Garg R, Hadda V, Mohan A, Guleria R: Bronchoscopic management of critical central airway obstruction by thyroid cancer: Combination airway stenting using tracheal and inverted-Y carinal self-expanding metallic stents. *Lung India* 2017; 34:202-5

Combination techniques

Observational studies, case reports, or non-pertinent comparison groups: combination techniques

(Observational data)

- 1 Dimitriou V, Voyagis GS, Brimacombe JR: Flexible lightwand-guided tracheal intubation with the intubating laryngeal mask Fastrach in adults after unpredicted failed laryngoscope-guided tracheal intubation. *Anesthesiology* 2002; 96:296-9

(Case reports)

- 2 Brenman S, Gupta S, Tseeng S: Successful retrograde intubation after failed fiberoptic intubation and percutaneous cricothyrotomy. *J Emerg Med* 2017; 53:550-3
- 3 Choi CG, Yang KH, Jung JK, Han JU, Lee CS, Cha YD, Song JH: Endotracheal intubation using i-gel(R) and lightwand in a patient with difficult airway: a case report. *Korean J Anesthesiol* 2015; 68:501-4
- 4 Dimitriou V, Voyagis GS, Douma A: Unexpected resistance during tracheal tube insertion through the intubating laryngeal mask. *Eur J Anaesthesiol* 1999; 16:419-20
- 5 Lillie EM, Harding L, Thomas M: A new twist in the pediatric difficult airway. *Paediatr Anaesth* 2015; 25:428-30

- 6 Pai Bh P, Shariat AN: Revisiting a case of difficult airway with a rigid laryngoscope. *BMJ Case Rep* 2019; 12:15
- 7 Pradhan D, Bhattacharyya P: Difficult airway management from Emergency Department till Intensive Care Unit. *Indian J Crit Care Med* 2015; 19:557-9
- 8 Ramkisson A, Hodgson RE: Nasal intubation of a difficult airway following supraglottic airway rescue facilitated by video laryngoscopy and a flexible intubation scope. *South Afr J Anaesth Analg* 2019; 25:42-5
- 9 Richa F: Intubating laryngeal mask airway combined to fiberoptic intubation in subglottic stenosis. *BMJ Case Rep* 2013
- 10 Sowers N, Kovacs G: Use of a flexible intubating scope in combination with a channeled video laryngoscope for managing a difficult airway in the emergency department. *J Emerg Med* 2016; 50:315-9
- 11 Vinayagam S, Dhanger S, Tilak P, Gnanasekar R: C-MAC® video laryngoscope with D-BLADE™ and Frova introducer for awake intubation in a patient with parapharyngeal mass. *Saudi J Anaesth* 2016; 10:471-3
- 12 Wei W, Qiu HR, Wang HX, Xue FS: Anesthesia and airway managements for emergency removal of esophageal foreign body in a trisomy 21 patient with mental retardation and predicted difficult airway: A case report. *Medicine* 2020; 99:e23710

Retrograde wire-guided intubation

Observational studies, case reports, or non-pertinent comparison groups

(Case report)

- 1 Miner JR, Rubin J, Clark J, Reardon RF: Retrograde intubation with an extraglottic device in place. *J Emerg Med* 2015; 49:864-7

Emergency invasive airway - cricothyrotomy (percutaneous), cricothyrotomy (surgical), tracheostomy, scalpel bougie technique or scalpel bougie tube technique versus needle cannula technique

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

- 1 Beshey, B. N., Helmy, T. A., Asaad, H. S. and Ibrahim, E. E. D. M.: Emergency percutaneous tracheotomy in failed intubation. *Egyptian Journal of Chest Diseases and Tuberculosis* 2014; 63:939-945

(Case reports)

- 1 Ayoub E, Tohme J, Lutfallah AA, Jabbour H, Chalhoub V, Naccache N: Intractable course of a submandibular abscess following difficult endotracheal intubation a case report. *J Med Libanais* 2019; 67:103-6
- 2 Bruserud Ø, Wendelbo Ø, Vetti N, Goplen FK, Johansen S, Reikvam H: Critical upper airway obstruction as the first symptom of acute myeloid leukemia - An anesthesiologic reminder. *Clin Prac* 2020; 10:34-6
- 3 Hodgson RE, Pillay TK: Awake percutaneous tracheostomy as an alternative to open emergency tracheostomy in a threatened airway. *South Afr J Anaesth Analg* 2017; 23:23-8
- 4 Kwon YS, Lee CA, Park S, Ha SO, Sim YS, Baek MS: Incidence and outcomes of cricothyrotomy in the "cannot intubate, cannot oxygenate" situation. *Medicine* 2019; 98:e17713

- 5 McCaffer CJ, Douglas C, Wickham MH, Picozzi GL: Acute upper airway obstruction and emergency front of neck access in an achondroplastic patient. *BMJ Case Rep* 2015; 2015
- 6 Nasa P, Singh A, Juneja D, Garg N, Singh O, Javeri Y: Emergency percutaneous tracheostomy in two cancer patients with difficult airway: An alternative to cricothyroidotomy? *South Asian J Canc* 2012; 1:90-2

Jet Ventilation (emergency cases only)

(Observational data)

- 1 Bouroche G, Motamed C, de Guibert JM, Hartl D, Bourgain JL: Rescue transtracheal jet ventilation during difficult intubation in patients with upper airway cancer. *Anaesth Crit Care Pain Med* 2018; 37:539-44

(Case reports)

- 1 Li Q, Xie P, Zha B, Wu Z, Wei H: Supraglottic jet oxygenation and ventilation saved a patient with 'cannot intubate and cannot ventilate' emergency difficult airway. *J Anesth* 2017; 31:144-7
- 2 Liang H, Hou Y, Wei H, Feng Y: Supraglottic jet oxygenation and ventilation assisted fiberoptic intubation in a paralyzed patient with morbid obesity and obstructive sleep apnea: A case report. *BMC Anesthesiol* 2019; 19

Extracorporeal membrane oxygenation (ECMO)

Observational studies, case reports, or non-pertinent comparison groups

(Case reports)

- 1 Kakizaki R, Bunya N, Uemura S, Narimatsu E: Successful difficult airway management with emergent venovenous extracorporeal membrane oxygenation in a patient with severe tracheal deformity: a case report. *Acute Med Surg* 2020; 7
- 2 Malpas G, Hung O, Gilchrist A, Wong C, Kent B, Hirsch GM, Hart RD: The use of extracorporeal membrane oxygenation in the anticipated difficult airway: A case report and systematic review. *Can J Anaesth* 2018; 65:685-97
- 3 Yunoki K, Miyawaki I, Yamazaki K, Mima H: Extracorporeal membrane oxygenation-assisted airway management for difficult airways. *J Cardiothorac Vasc Anesth* 2018; 32:2721-5

5. CONFIRMATION OF SUCCESSFUL INTUBATION

Capnography or end-tidal CO₂ detection

Observational studies, case reports, or non-pertinent comparison groups

(Observational data)

- 1 Dohi S, Inomata S, Tanaka M, Ishizawa Y, Matsumiya N: End-tidal carbon dioxide monitoring during awake blind nasotracheal intubation. *J Clin Anesth* 1990; 2:415-9
- 2 Williamson JA, Webb RK, Szekely S, Gillies ER, Dreosti AV: The Australian Incident Monitoring Study. Difficult intubation: An analysis of 2000 incident reports. *Anaesth Intensive Care* 1993; 21:602-7

(Case reports)

- 1 Earl DS, Shinde S, Bullen KE, Carter JA: Novel use of capnography during an awake fiberoptic intubation. *Anaesthesia* 2002; 57:194-5
- 2 Wolf LH, Gravenstein D: Capnography during fiberoptic bronchoscopy to verify tracheal intubation. *Anesth Analg* 1997; 85:701-3

6. EXTUBATION

Assess readiness for extubation

Nonrandomized comparative studies

- 1 Lin YT, Lee YS, Jeng MJ, Chen WY, Tsao PC, Chan IC, Soong WJ: Flexible bronchoscopic findings and the relationship to repeated extubation failure in critical children. *J Chin Med Assoc* 2018; 81:804-10

Tracheal tube exchange (staged extubation and reintubation)

Tracheal tube exchanged (replaced) with an airway exchange catheter

Observational studies, case reports, or non-pertinent comparison groups: awake extubation

(Observational data)

- 1 McManus S, Jones L, Anstey C, Senthuran S: An assessment of the tolerability of the Cook staged extubation wire in patients with known or suspected difficult airways extubated in intensive care. *Anaesthesia* 2018; 73:587-93
- 2 Mort TC: Continuous airway access for the difficult extubation: The efficacy of the airway exchange catheter. *Anesth Analg* 2007; 105:1357-62

(Case reports)

- 1 Fetterman D, Dubovoy A, Reay M: Unforeseen esophageal misplacement of airway exchange catheter leading to gastric perforation. *Anesthesiology* 2006; 104:1111-2
- 2 Yegian CC, Volz LM, Galgon RE: Use of an Airway exchange catheter-assisted extubation with continuous end-tidal carbon dioxide monitoring in a pediatric patient with a known difficult airway: A case report. *A A Prac* 2018; 11:233-5

7. FOLLOW-UP CARE

Documentation of difficult airway and management in the medical record and to the patient

Observational studies, case reports, or non-pertinent comparison groups: awake extubation

(Case report)

- 1 Salzarulo HH, Taylor LA: Diabetic "stiff joint syndrome" as a cause of difficult endotracheal intubation. *Anesthesiology* 1986; 64:366-8