International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

A Study of Effectiveness of Disposable D Blade Video Laryngoscope in Adult Patients undergoing Cervical Spine Surgery

Dr. Priyanka Gangad[1], Dr. Deepali Thakur[2]

[1]Third year Resident, Department of Anaesthesia, LTMMC, Sion, Mumbai, Maharashtra, India
Email: *priyankagangad95[at]gmail.com*
Phone no: 9822892697

[2]Associate Professor, Department of Anaesthesia, LTMMC, Sion, Mumbai, Maharashtra, India
Email: *deepalithakur216[at]gmail.com*
Phone no: 9819811053

Abstract: ***Aim: This study was performed to evaluate effectiveness of D blade video laryngoscope with respect to first attempt success rate, intubation and laryngoscopy time, intubation difficulty score (IDS) in adult patients undergoing cervical spine surgery. Materials and Methods: This prospective study was carried out at a tertiary care hospital. Total 40 adult patients for elective surgery under general anaesthesia were included in this study. First attempt intubation success rate, laryngoscopy and intubation time, IDS were noted during the intubation. Result: Our study showed that 97.5% patients were intubated in first attempt and only 1 patient required second attempt at intubation. Mean laryngoscope time and intubation time required was 15.28 ± 4.57 and 19.68 ± 4.03 respectively. Also study showed 27.5% patients had IDS score 0 and 72.5% patients had score between 1-5. Conclusion: Disposable D blade video laryngoscope offers high first attempt success rate by providing good laryngeal view, less laryngoscopy and intubation time and low IDS score during intubation in adult patients undergoing cervical spine surgery.***

Keywords: Intubation, Videolaryngoscope, D blade

1. Introduction

Cervical spine pathology is becoming increasingly prevalent due to trauma, infections and degenerative diseases which can result in significant long-term disability. Several reports state that approximately 2–4% of trauma patients have cervical spine injuries (CSIs) out of which roughly 20% have spinal cord injury (SCI), 10% have multi-level injuries and 10% have pure ligamentous injuries. [1, 2] The consequences of cervical spine injury are due to injury to the spinal cord. The Spinal cord injury risk increases in the presence of head injury, when level of consciousness is decreased and focal neurological deficit is present. Most common cause of cervical spine injury is trauma due to road traffic and railway accidents. Cervical spine surgeries are mainly designed to relieve compression of spinal cord or spinal nerve roots. Indications for cervical spine surgery can be neurological dysfunction, structural instability, pathological lesions like tumour, infection, deformity. Patient with c-spine injury may need quick management of airway for airway protection, to avoid hypoxia and hypoventilation. [3]Management of airway in patients with anticipated cervical spine injury may result in higher neurological injury. In patients having cervical spine pathology, cervical spine immobilisation and use of appropriate intubation devices is recommended during airway management. Cervical spine immobilisation can be done using either rigid collar, a forehead tape and manual-in-line stabilisation (MILS) recommended by trauma life support. MILS avoids the extension of head and flexion of neck which is important for optimal alignment of three airway axis. [4]

Frederic Adnet F et al, [5] in 1997 designed intubation difficulty score (IDS) which is a blend of subjective and objective criteria that permit qualitative and quantitative approach to the progressive nature of intubation difficulty. This score aids in the evaluation of factors linked to difficult intubation and provides a uniform approach for comparing difficulty of intubation. [5]

Over the years, many alternative laryngoscopy equipments like McCoy laryngoscope, video laryngoscopes, C-Trach LMA, optical stylets have emerged as possible solutions for airway management in patient with cervical spine injury. [6]

Video laryngoscope (VL) with hyper-angulated D blade is one of the recent advances in difficult airway management. In various studies, it has shown to provide better visualisation of larynx thus, lowering the incidence of difficult intubation. Few studies using video laryngoscope with D blade are available in simulated cervical spine injury. Hence, we are undertaking this study to evaluate efficacy of video laryngoscope with D blade in patients undergoing elective cervical spine surgery in terms of first attempt success, duration of intubation and IDS.

2. Materials and Methods

This prospective observational study was carried out at our institute. Ethical permission was obtained from the ethics committee. Informed written consent was obtained from each patient and the procedure was explained to the patients. Total 40 patients of either sex, age >18 years posted for elective cervical spine surgery under general anaesthesia were evaluated for the study purpose.

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Inclusion criteria:

a) All patients between 18 to 60 years undergoing elective cervical spine surgery requiring oral endotracheal intubation.
b) Patients with adequate nil by mouth (NBM) status.
c) Patients with ASA I, ASA II and ASA III classification.

Exclusion criteria:

a) Patient not giving consent
b) Patient with pre-existing Endotracheal tube/ tracheostomy tube.
c) Patients with mandible fracture, intraoral malignancy, restricted mouth opening (<1.5cm) and any other intraoral pathology affecting oral tracheal intubation.

Patients undergoing cervical spine surgery with oral endotracheal intubation using disposable D blade video laryngoscope meeting inclusion and exclusion criteria were included in the study after obtaining written informed consent. Standard monitoring including electrocardiography, non-invasive blood pressure, pulse oximetry and capnography was used in all patients.

All patients were given premedication as per baseline haemodynamic parameters. The choice of premedication agents, induction agent, muscle relaxant and inhalational agent was decided by consultant anaesthesiologist. All patients were pre-oxygenated for three minutes with 100% O2. Baseline parameters such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were recorded. Anaesthesia was induced. After confirming ventilation, non-depolarizing muscle relaxant was given. Patient was ventilated manually with oxygen: nitrous oxide (50: 50) for two and half minute and then with 100% oxygen for 30 seconds. After adequate neuromuscular blockade, the neck was immobilised using manual-in-line-stabilisation (MILS) applied by an experienced individual holding the sides of the neck and mastoid process, thus preventing flexion, extension or rotational movement of head and neck during intubation. Laryngoscopy was done by experienced anaesthesiologist who has performed at least fifty intubations using video laryngoscope. Oral endotracheal intubation was done using video laryngoscope with D Blade. Flexo-metallic cuffed endotracheal tube (ETT) with Metallic stylet was used. Endotracheal tube no 6.5 and 7 was inserted for female and male patients respectively. The correct placement of ETT was confirmed by capnography, chest wall movements and auscultation of breath sounds. After confirming correct placement of ETT, anaesthesia breathing circuit was connected to start positive pressure ventilation.

Laryngoscopy time and intubation time was recorded. Laryngoscopy time was calculated as time from insertion of laryngoscope till visualization of vocal of vocal folds and glottis. While the intubation time is summation of duration of Laryngoscopy and intubation. It is calculated from time the facemask is taken off patient's face to appearance of first square waveform on capnograph. Ease of intubation as per Intubation Difficulty Score (IDS), duration for intubation, number of attempts and complications were recorded for the study purpose. Failed intubation cases managed by in charge anaesthesiologist as per difficult intubation protocol.

Statistical analysis

Considering the power of the study 80%, alpha error of 0.05, we calculated sample size of 36. With the drop out of 10%, we included 40 patients for this study. Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago).

3. Observation and Results

This clinical study comprised of 40 adult patients.

Table 1: Demographic Data

Variable	(n=40) n (%)
Age (Years)	
18-30	8 (20.0)
31-40	14 (35.0)
41-50	9 (22.5)
51-60	9 (22.5)
Mean ± SD	40.35 ±11.38
Gender	
Female	15 (37.5)
Male	25 (62.5)
ASA	
1	19 (47.5)
2	21 (52.5)

Demographic data showed that mean age of patients in the study group was 40.35 ±11.38.

Table 2: Intubation difficulty scale (IDS)

Intubation difficulty scale	Study group (n=40) n (%)
N1 (number of attempts)	
1st (Score = 0)	39 (**97.5**)
2nd (Score =1)	1 (2.5)
N2 (Number of operators)	
1 (Score = 0)	35 (87.5)
2 (Score = 1)	5 (12.5)
N3 (Alternative techniques used)	
Not used (Score = 0)	34 (85.0)
Used (Score = 1)	6 (15.0)
N4 (Cormack and Lehane grade)	
1 (Score = 0)	24 (60.0)
2 (Score = 1)	14 (35.0)
3 (Score = 2)	2 (5.0)
4 (Score = 3)	-
N5 (Lifting force required)	
Not required (Score = 0)	33 (82.5)
Required (Score = 1)	7 (17.5)
N6 (Laryngeal pressure)	
Not applied (Score = 0)	29 (72.5)
Applied (Score = 1)	11 (27.5)
N7 (Vocal cord position)	
Abducted (Score = 0)	30 (100)
Adducted (Score = 1)	-

IDS score	Group V (n=40), n (%)
0 (Easy)	11 (27.5)
1-5 (slightly difficult)	29 (72.5)
>5 (Moderate to major difficult)	-

From the data collected it was found that 27.5% patients who were intubated using D blade video laryngoscope had

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IDS score 0 (easy intubation) and 72.5% patients had IDS score 1-5 (slightly difficult intubation). No patient in the study group had IDS score more than 5. The results showed that D blade video laryngoscope provides more ease of intubation.

Table 3: Laryngoscopy and intubation time:

	Study Group,(n=40), Mean (SD)
Laryngoscopy Time (sec)	15.28 ± 4.57
Duration of Intubation (sec)	19.68 ± 4.03

The data showed that mean laryngoscopy time required using D blade video laryngoscope was 15.28 ± 4.57 and mean duration of intubation was 19.68 ± 4.03.

4. Discussion

Cervical spine injuries, although uncommon can result in significant and long-term disability. Several reports state that approximately 2-4% of trauma patients have cervical spine injuries. [1, 2]

Manual in line stabilization (MILS) or rigid collars are recommended by trauma life support guidelines to stabilize the spine in cervical spine injury patients. [7] The intubation with conventional laryngoscope may become difficult in such scenario because of poor laryngoscopy view. To overcome this difficulty, various newer intubation devices are available in the market. The goal of all advances in the management of airway is to achieve better maintenance of airway and adequate ventilation in both elective and emergency situations.

The newer generation video laryngoscopes have many distinct advantages. The video laryngoscope has external light source and a tiny digital camera, attached to a display monitor. It gives optimum visualization of glottis by direct and indirect view even with minimal cervical spine movement. [8] Video laryngoscope (VL) with disposable blades is one of the recent advances in difficult airway management. D blade of VL is a special type of blade designed for difficult intubation, with inbuilt angulation. [8] Due to highly pronounced curvature it provides better view of laryngeal structures.

In our prospective observational study, we have studied efficacy of D blade video laryngoscope in patients undergoing cervical spine surgery with respect to first attempt success rate of intubation. Total 40 patients with cervical spine injury for orotracheal intubation were intubated using VLS with D blade. The neck was immobilised using manual-in-line-stabilisation (MILS) during intubation.

In our study 97.5% patients in were intubated in first attempt. While only 2.5% patient required another attempt for intubation. The results found in our study were same as the studies done by **Jain et al.** [9] **and Sabry et al.** [10] Sabryet al. compared C-MAC D blade and McCoy Laryngoscope in intubating patients during cervical immobilization. In this study, C-MAC D-blade resulted in more successful intubation in first attempt than the McCoy laryngoscope (90% vs 66.7% with P= 0.028).

The mean laryngoscopy time and the mean duration of intubation was recorded. The results of our study showed mean laryngoscopy time of 15.28 ± 4.57 seconds. We found that the mean duration of intubation was19.68 ± 4.03 seconds.

The results were similar to the study done by **Garg et al.** [11] They compared efficacy of CMAC VL with McCoy laryngoscope for intubation in anticipated difficult airway. The results showed that CMAC VL required lesser median time of intubation in seconds (15 vs 18, P=0.007) compared to McCoy laryngoscope.

Frederic Adnet et al (1997) [5] developed a quantitative score, intubation difficulty score (IDS) that can be used to evaluate intubating conditions and techniques with the aim of determining the relative values of predictive factors of intubation difficulty and of the techniques used to decrease such difficulties. This score contains seven parameters which quantitatively determine intubation complexity. Score may be calculated by the operator or an independent observer immediately after intubation. IDS score was observed in the participants to evaluate the ease of intubation. Seven parameters of IDS are as follows: N1 (number of attempts), N2 (number of operators), N3 (number of alternative techniques used, N4 (Cormack-Lehane grade), N5 (lifting force required), N6 (laryngeal pressure applied) and N7 (vocal cord mobility). Total score is sum of N1 to N7.

As per IDS parameters, first attempt success rate was higher. Only 15% patients required the use of alternative techniques like repositioning of patient, change of ETT, addition of stylet, use of bougie or intubation with fibrescope/through laryngeal mask.

In our study, out of 40 patients 24 (64%) patients had CL grade 1. CL grade 2 was seen in 14 (35%) patients and CL grade 3 was seen only 2 (5%) patients. No patients showed CL grade 4 on laryngoscopy. Our study showed that the glottic exposure was good with D blade VLS. These results of our study were similar to studies done by **Jain et al** [9] and **Sabry et al.** [10]

Jain et al. [9] compared McCoy laryngoscope and C-MAC video laryngoscope in simulated cervical spine injury and observed that out of 30 patients, 29 patients in C-MAC group and 16 patients in McCoy group had CL grade 1 and was statistically significant.

Ease of intubation was determined from IDS score. Score 0 with easy intubation, Score 1-5 with slightly difficult intubation and score >5 with moderate to major difficulty in intubation. As per our findings, 11 (27.5%) had IDS score 0. IDS Score 1-5 was present in 29 (72.5%) patients and no patient had IDS score was >5. The level of intubation difficulty was lower with D blade video laryngoscope. These findings of our study were similar to the study done by **Jain et al.** [9] and **Sarvaiya et al.** [12]

As regards to the complications related to our study, there were no major complications noted.

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5. Conclusion

From our study we conclude that, disposable D blade video laryngoscope has high first attempt success rate of intubation. It improves glottic visualisation leading to less laryngoscopy time, intubation time with less intubation difficulty as per IDS score. The Disposable D blade video laryngoscope is an effective tool for intubation with manual in line stabilisationin patients with cervical spine injuries.

Conflict of Interest: None

Source of support: Nil

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