

Role of videolaryngoscope in the management of difficult airway in adults: A survey

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ABSTRACT

Background and Aims: A number of videolaryngoscopes (VLs) have flooded the Indian market. As per All India Difficult Airway Association 2016 guidelines, all anaesthesiologists should have access to a VL and must be trained to use it. We conducted an electronic survey to know the perception of Indian anaesthesiologists, who are members of the Indian Society of Anaesthesiologists (Karnataka State Chapter) towards the role of VL in the management of difficult airway (DA) and factors governing their use. **Methods:** An electronic survey was sent to 2580 ISA members to know the availability, use and attitude towards VLs in the management of DA in adults. The survey was open for a period of 2 months and responses analysed. **Results:** The response rate was 25.8% (666 out of 2580). A total of 280 (42%) respondents had access to VL. The respondents rated VL as 4th preference for anticipated DA and 1st for unanticipated DA (if available). The most widely used VLs were C-MAC, Airtraq, and Kingvision. As per 133 respondents (20%), access to VL in institutes was restricted only to consultants and the main reason being cost. The clarity of the image was the most important factor the respondents expected in a VL. **Conclusions:** Less than half of respondents had access to VLs. Most of them having access to it worked in corporate hospitals. The high cost of the device and steep learning curve are still barriers against its widespread use. We conclude that low-cost devices, with increased clarity may make usage of VLs frequent and available to residents.

Key words: Difficult airway, survey, videolaryngoscope

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INTRODUCTION

In 2001, with the introduction of commercial video laryngoscopes (VLs), there was a paradigm shift in the management of difficult airway (DA). Despite few limitations associated with VL,^[1] these devices have shown to improve the laryngeal view and success rate of tracheal intubation,^[2] and have now become a first backup technique after failed intubation attempts.^[3] Most DA guidelines emphasise the role of VL in the management of both anticipated and unanticipated DA.^[4-6]

Videolaryngoscopy has expanded exponentially in the last few years with a number of devices entering the market. Publications report a number of benefits, but it is not known to what degree these devices have penetrated the routine practice, especially in a price-sensitive market like India. Understanding its adoption in routine practice is useful in understanding

the perception towards these devices and identify the barriers to its wider utility. For this reason, we conducted an electronic survey to know its availability and the perception of Indian anaesthesiologists towards the role of VL in the management of DA and the factors governing their use.

METHODS

To validate the present survey, an extensive review of the literature was done by authors, and a questionnaire

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was designed. Further, an expert validation was sought from senior anaesthesiologists and changes were made as per their suggestions. Formal approval by an Institutional Ethics Committee was not required as it did not involve any intervention on patients. The survey was designed in a way that the first half had questions pertaining to demographic details and DA management, whereas the second half had questions relevant to the availability and use of VL and perception towards its use for DA as shown in Appendix 1. The e-mail ids of the Indian Society of Anaesthesiologists (ISA) members of the Karnataka State Chapter were obtained from the competent authority with prior permission.

Questions related to the primary workplace, professional experience, number of general anaesthesia cases handled in a week, percentage of DA cases encountered, access to VL, restriction to the usage of VL and its reason, and willingness to pay for a smartphone-based VL had a single option. Whereas the questions related to the availability of various airway devices and types of VL had multiple options. However, questions pertaining to the preferred technique for managing anticipated and unanticipated DA cases and the features desirable in VL had options to be arranged in the order preferred.

The survey was designed using the online platform—www.surveymonkey.com and the link sent to the e-mail ids of the participants. The survey was open for a period of 2 months from 26 October 2018 to 26 December 2018. The participants were sent reminders every fortnight during this period until their response was recorded. The VLs included in the survey are mentioned in Appendix 2.

RESULTS

Out of the 2580 ISA members to whom the survey was sent, 666 members responded over a period of 2 months. The response rate was 25.8% (666 out of 2580).

Of the 666 responding anaesthesiologists, 153 (23%) primarily worked in government medical colleges, 221 (33%) in private medical colleges, 206 (31%) in corporate hospitals, 53 (8%) in government hospitals (not linked to medical college) and 33 (5%) in private nursing homes. A total of 260 (39%) of them were consultants with 0–5 years of work experience, 180 (27%) were residents and

the remaining (34%) had more than 5 years of experience.

The respondents overall handled an average of 28 general anaesthesia cases per week. Of these, they encountered an average of 8% DA cases.

Of the various devices for managing DA, 96% of the respondents were equipped with supraglottic airway devices (SGADs), 98% with a bougie, 81% with McCoy laryngoscope, 72% with a fiberoptic laryngoscope, 63% with a tracheostomy set, 42% with a VL, 20% with a retrograde intubation set, and 8% with an intubation video stylet [Figure 1].

In cases of an anticipated DA, the regional block was the first preference for 47% of the respondents. A total of 24% of the respondents preferred to attempt conventional method once, 16% preferred fiberoptic laryngoscopy, 13% VL, 5% SGADs and only 1% preferred blind nasal intubation as their first choice [Figure 2].

In cases of unanticipated DA, VL was the first preference for 49% of the respondents (if available). A total of 44% of the respondents preferred SGADs as a first choice followed by awake intubation and tracheostomy in 8% and 5% of the respondents, respectively [Figure 3].

Two hundred and eighty (42%) respondents had access to VL at their workplace. The most commonly available one was the C-MAC (48%), followed by Airtraq (32%), King vision (32%), Glidescope (18%), McGrath (11%), C-Trach (7%), Medicam (5%), Wuscope (3.5%) and Pentax AWS (3.5%) [Figure 4].

Of the 280 respondents who had access to VL, 20% mentioned restricted access of these devices to

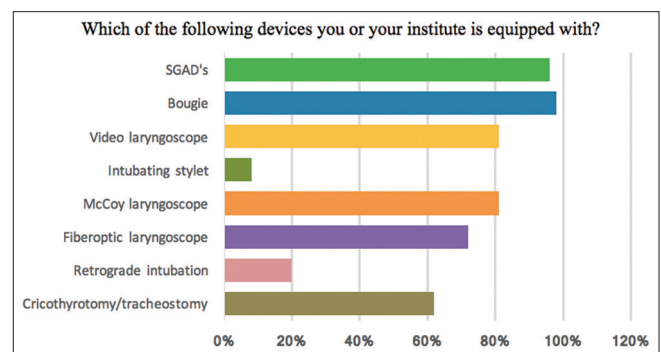


Figure 1: Graphical representation of the percentage of airway devices available

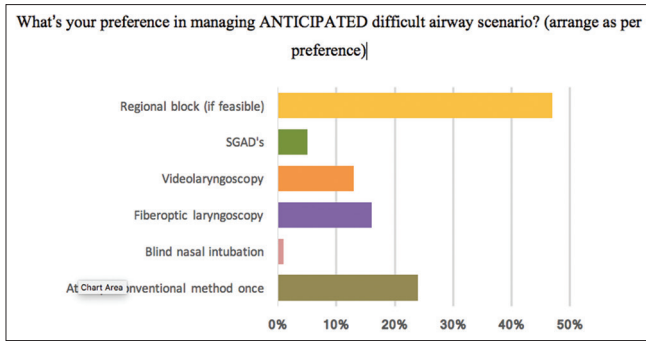


Figure 2: Graphical representation of percentage of preference for managing anticipated difficult airway

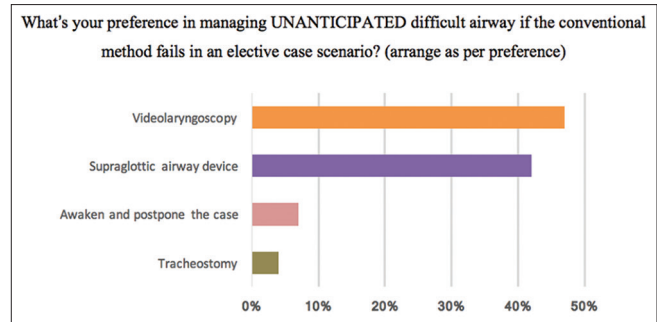


Figure 3: Graphical representation of percentage of preference for managing unanticipated difficult airway

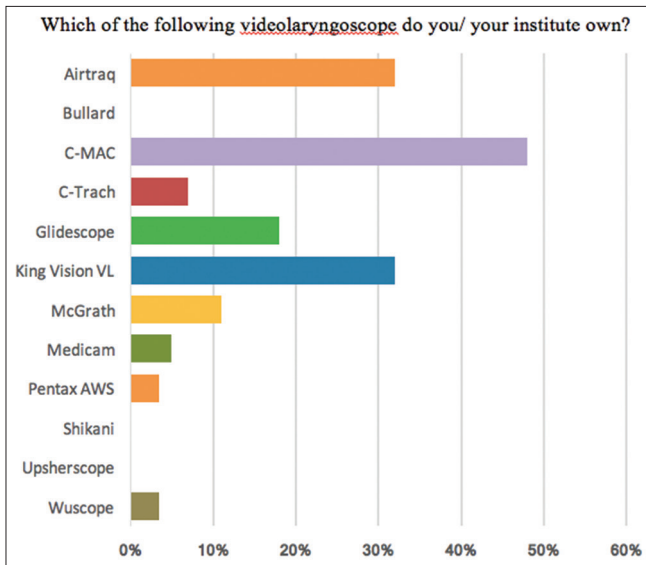


Figure 4: Graphical representation of percentage of various types of videolaryngoscopes available with respondents

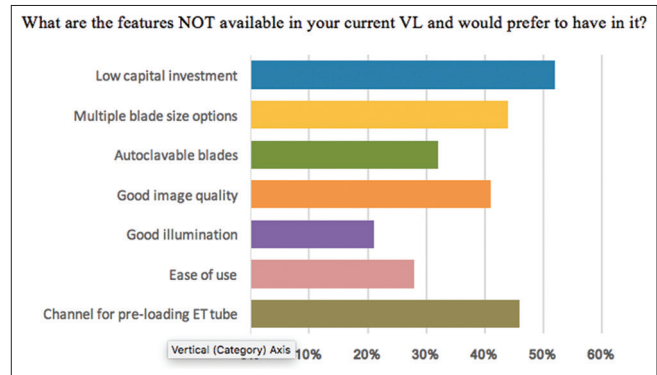


Figure 5: Graphical representation of favourable features preferred by respondents

consultants only, the main reason for it being the high cost of the device.

Of the respondents who currently have access to VLs but wanted features currently not available in them, 52% preferred that these devices come with a lower capital investment. A total of 46% preferred to have a channel for pre-loading the endotracheal tube (ET), 44% felt it would be nice to have multiple blade size options. 41% wanted better image quality, 32% wanted autoclavable blades and 21% wanted better illumination [Figure 5].

The most common reason for not owning a VL in the remaining 58% of respondents was the high cost of the device (79%). A total of 18% felt that a lack of multiple blade size options deferred them from owning it. A total of 8% felt there is no great advantage of a VL over conventional methods and 8% felt that it had a steep learning curve.

Some of the ‘must have’ features the respondents wanted in an ideal VL were clear image quality (89%), reusability of the device (74%), multiple blade size options (68%), a guided channel for ET tube (47%), steep learning curve (32%), lightweight and portable (31%) and low cost (18%).

DISCUSSION

This survey provides a gist of the availability and the perception of anaesthesiologists who are members of ISA (Karnataka State Chapter) towards the role of VL in the management of DA and factors governing their use. We are aware of a similar survey done in the UK, but the present survey is one amongst the few surveys done in India on the management of DA and the role of VL.^[7]

Numerous benefits of VL have been reported, and these include improved laryngeal view, visual confirmation of tube placement, high rates of successful rescue after failure of direct laryngoscopy,^[2] reduction in applied force,^[8] a steep learning curve,^[9] improved training of novices,^[10,11] and improved operator ergonomics,^[12] but evidence of benefit is not available for all devices or all circumstances, making clinical decisions and

device choice complex. A systematic Cochrane review comparing VL with direct laryngoscopy reported improved glottic view, reduced intubation failure as well as reduced incidence of laryngeal/airway trauma. However, no differences were noted in time to intubation or incidence of respiratory complications.^[2]

The recent guidelines for the management of the unanticipated DA in adults recommend that a VL should be immediately available at all times and that all anaesthetists should be trained and skilled in their use.^[4,5] As per All India Difficult Airway Association 2016 guidelines,^[5] a maximum of 3 attempts with a direct or VL is recommended with a consideration to change in device/technique/operator in between attempts. However, as per the Difficult Airway Society 2015 guidelines^[4] a maximum of 3+1 attempts with direct/VL is recommended in the management of unanticipated DA in adults.

Despite the advantages of VL and the guidelines mentioned above, only 42% of the respondents in the present survey had access to VL at their workplace. This was much less compared to the availability of VL in the UK which was 91%.^[7] Three VLs (C-MAC, Kingvision and Airtraq) dominate the Indian market. The single-use Airtraq is economical when used infrequently and eliminates infection risks, but its single-use nature makes it expensive for widespread use. Most of the centres in India reuse the disposable devices to cut the cost of procuring a new device.

In this study, usage and attitudes to VL varied widely, being the first preferred device (if available) for unanticipated DA and fourth for an anticipated DA. In the case of non-availability of VL, SGAD was the first rescue device in unanticipated DA cases as per the findings of the present study. In a recent report by Wong *et al.*, 96% of respondents choose VL as the first choice rescue technique in unanticipated difficult laryngoscopy.^[13] In India, we attribute the reduced usage of VL to the cost constraints of the procurement.

When faced with an unanticipated DA, the majority (44%) of the respondents chose SGADs as the rescue device which shows their awareness of ASA DA algorithm (*Category B4-B evidence*).^[14] Similar observations were made by Rajesh MC *et al.* in 2015.^[15] The high availability because of affordability and ease of use may be the reason for this choice.

In the current survey, 47% of the respondents preferred regional anaesthesia in cases of anticipated

DA whenever feasible. This was in unison with the findings of a survey done by Neamat I *et al.* who reported that 74% of respondents preferred regional anaesthesia in the anticipated difficult airway.^[16]

However, as per ASA DA 2013 updates (*Category B3-B evidence*),^[14] we believe it's important to plan awake intubation for securing the airway using either a VL or fibreoptic laryngoscope because if regional anaesthesia fails or wears off before the completion of surgery then there will be a risk of emergency in the absence of preformulated strategy for intubation. But since fibreoptic bronchoscope is more expensive and has a shallower learning curve than VL, and requires continuous practice to maintain the skill and in addition is associated with procedure-related complications,^[17,18] VLs become a preferable option over fibreoptic intubation. The technique also requires adequate equipment and patient preparation. Some potential advantages of VLs over fibreoptic laryngoscopes: provide a wider view of the airway, no limitation on the ET diameter, it is easier to change the size of the tracheal tube if required while maintaining the airway view, unlike the fibreoptic technique.

Restrictions on the use of VL imposed by consultants in view of the high cost of the equipment was a surprise finding in this study. Such restrictions prevent residents from learning VL during their training period.

There are several limitations to the present survey. It is possible that non-responders would be more likely to be non-users of VL, although this is uncertain. If this were the case, it would mean that the survey has underestimated the proportion of anaesthesiologists who do not have access to VL. Moreover, hospitals and institutes who had fibreoptic laryngoscopes would not see an added advantage to invest on a VL and hence would reflect a decreased availability of this device. Also, the current study not being a nationwide survey and response rate being 25.8% could have given biased results.

Though a number of do it yourself (DIY) VLs have been described in the literature using simple borescope cameras, none of them have been launched commercially yet. We believe this may be due to the regulatory hurdles involved and the high investment needed for developing and marketing the device as well as the inability to patent the device. We intend to develop a low-cost device on similar lines in the

near future to empower every anaesthesiologist with this technique and hopefully, it will become the first choice for difficult intubation in the coming years.

CONCLUSIONS

Less than half of the respondents had access to VLs. Most of them having access to it worked in corporate hospitals. The high cost of the device and poor image quality are still barriers against its widespread use. There is a marked variation in the preference of VL and the selection of other devices for the management of DA. Three-fourth of the respondents expressed interest to own a VL if the capital investment was low. We conclude that low-cost devices, with increased clarity may increase the usage of VLs and its availability to the residents.

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Conflicts of interest

There are no conflicts of interest.

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APPENDIX 1 - SURVEY QUESTIONNAIRE

1. Primary Workplace?	
1. Government Medical College	4. Corporate hospital
2. Private Medical College	5. Private nursing home
3. Government hospital	
2. Professional experience?	
1. I am currently a resident	4. Consultant 11-20 years experience
2. Consultant 0-5 years experience	5. Consultant >20 years experience
3. Consultant 6-10 years experience	
3. Approximate number of GA cases you handle in a week?	
4. Approximate PERCENTAGE of difficult airway cases (both anticipated and unanticipated) you come across in a week?	
5. Which of the following devices you or your institute is equipped with?	
1. LMA/I-Gel/other supraglottic airway devices	5. McCoy laryngoscope
2. Bougie	6. Fiberoptic laryngoscope
3. Videolaryngoscope	7. Retrograde intubation kit
4. Intubating video stylet	8. Cricothyrotomy/tracheostomy kit
6. What's your preference in managing ANTICIPATED difficult airway scenario? (arrange as per preference)	
1. Regional block (if feasible)	
2. Supraglottic airway devices (SGAD)	
3. Videolaryngoscopy	
4. Fibreoptic laryngoscopy	
5. Blind nasal intubation	
6. Attempt conventional once	
7. What's your preference in managing UNANTICIPATED difficult airway if the conventional method fails in an elective case scenario? (arrange as per preference)	
1. Supraglottic airway devices (SGAD)	
2. Videolaryngoscopy (if available)	
3. Awaken and postpone the case	
4. Tracheostomy	
8. Do you or your institute own a videolaryngoscope?	
1. Yes	
2. No	
Those who answered 'yes' to question no.8 followed the following sequence	
9. Which of the following video laryngoscope do you/your institute own?	

1. Airtraq (Prodol Meditec, Guecho, Spain)
2. Bullard (Circon, ACMI, Stamford, C.T, USA)
3. C-MAC (Karl Storz, Slough, UK)
4. C-Trach (Laryngeal mask company, Henley-on-Thames, UK)
5. GlideScope (Verathon UK, Amersham, UK)
6. King Vision VL (Ambu, St Ives, UK)
7. McGrath (Aircraft Medical, Edinburgh, UK)
8. Pentax AWS (Pentax, Tokyo, Japan)
9. Shikani intubating stylet (Clarus Medical, Minneapolis, MN, USA)
10. Upsherscope (Mercury Medical, Clearwater, FL, USA)
11. Wuscope (Pentax Precision instruments, Orangeburg, NY, USA)
12. Medicam (Medicam India Pvt Ltd, India)
13. Others(please specify)
10. Is the use of videolaryngoscope restricted to consultants only (and not residents)?
1. Yes
2. No
Those who answered 'yes' to question no.10 were asked question no.11, and those who answered 'no' jumped to question no.12
11. Reason for restricting the use of videolaryngoscope to consultants only
1. Expensive equipment and may get damaged
2. Residents aren't trained to use it
3. Residents should master the conventional method first
4. Other (please specify)
12. What's are the features NOT available in your current VL and would prefer to have in it?
1. Low capital investment
2. Multiple blade size options
3. Autoclavable blades
4. Good image quality
5. Good illumination
6. Ease of use
7. Channel for pre-loading the ET tube
13. If you were to own a smartphone based reusable videolaryngoscope, what would be the maximum amount you would be willing to pay for it?
1. Rs. 10000
2. Rs. 15000
3. Rs. 20000
4. Rs. 25000
Those who answered 'no' to question no.8 followed the following sequence
9. What is/are the reason/s for not owning a videolaryngoscope?
1. Devices available in the market are expensive
2. Bulky and not portable

3. Do not have options of different blade sizes
4. Steep learning curve
5. Not happy with the clarity of the image displayed
6. I feel there is no great advantage of VL over conventional methods
7. Others (please specify)
10. If you were to own a smartphone based reusable videolaryngoscope, what would be the maximum amount you would be willing to pay for it?
1. Rs. 10000
2. Rs. 15000
3. Rs. 20000
4. Rs. 25000

APPENDIX 2

The videolaryngoscopes included in the survey were as follows:

1. Airtraq (Prodol Meditec, Guecho, Spain)
2. Bullard (Circon, ACMI, Stamford, C.T, USA)
3. C-MAC (Karl Storz, Slough, UK)
4. C-Trach (Laryngeal mask company, Henley-on-Thames, UK)
5. GlideScope (Verathon UK, Amersham, UK)
6. King Vision VL (Ambu, St Ives, UK)
7. McGrath (Aircraft Medical, Edinburgh, UK)
8. Pentax AWS (Pentax, Tokyo, Japan)Z
9. Shikani intubating stylet (Clarus Medical, Minneapolis, MN, USA)
10. Upsherscope (Mercury Medical, Clearwater, FL, USA)
11. Wuscope (Pentax Precision instruments, Orangeburg, NY, USA)
12. Medicam (Medicam India Pvt Ltd, India).