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Video Laryngoscope Assisted Laryngeal Surgery: Techniques and Benefits

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ABSTRACT

Objective: To evaluate the intraoperative performance of videolaryngoscopy for glottic exposure and surgical feasibility of Besdata Video laryngoscope during phonosurgeries.

Methods: This prospective descriptive observational study included 74 patients undergoing elective laryngeal surgery at a tertiary care hospital using the BESDATA video laryngoscope. It utilizes fibre-optic systems integrated into the laryngoscope blade to provide indirect visualization of the glottis on a video monitor. Glottic exposure was assessed using the Percentage of Glottic Opening (POGO) score and Cormack-Lehane (CL) grading. Outcomes assessed were the extent of glottic exposure and the intraoperative surgical feasibility.

Results: All 74 patients achieved adequate glottic visualization with POGO score of 75-100% and Cormack-Lehane of Grade I view. Benign vocal cord lesion excisions were performed successfully even in cases with difficult exposure. Since it's a Single-handed surgery, it was challenging but managed with malleable surgical instruments. No significant procedure-related complications were observed. Patients had no complains of cervical or dental pain post-operatively.

Conclusion: The videolaryngoscopy is a safe and effective alternative surgical tool for direct laryngoscopy for benign laryngeal pathologies, providing adequate visualization and facilitating successful surgical outcomes with minimal complications. Post-operative outcomes were satisfactory and no residual or recurrent disease was noted. Its role in more complex procedures requires further evaluation.

Keywords: Video laryngoscope; Direct laryngoscope; Larynx; Hyper-angulated blades

INTRODUCTION

Laryngoscopy is a critical procedure in medical practice and requires appropriate training to ensure successful execution and patient safety. It is routinely performed to visualise the glottis and upper airway in patients undergoing surgery and endotracheal intubation. Intraoperatively, the larynx is visualised using a direct laryngoscope, where optimal exposure of the vocal cords depends on proper alignment of anatomical axis, operator experience, and patient positioning. An ideal laryngoscopic view should provide clear visualisation of the glottis, enable a smooth operative field, reduce procedural time, and minimise the risk of patient injury.

With advancements in airway management technology, the video laryngoscope (VL) has emerged as an effective alternative to direct laryngoscopy (DL). Videolaryngoscopy utilises micro-cameras, prisms, or fibreoptic systems integrated into the laryngoscope blade to provide indirect visualisation of the glottis on a video monitor. This design allows visualisation of airway structures even without strict alignment of the oral, pharyngeal, and laryngeal axis, thereby potentially improving glottic exposure, particularly in difficult airways [1-3].

The videolaryngoscopy is being used as a diagnostic tool but its intraoperative usage as a surgical equipment is limited. The present study aims to evaluate the intraoperative performance of videolaryngoscopy, with particular emphasis on glottic exposure and ease of surgical manipulation during microlaryngoscopic procedures. By assessing visualisation using objective parameters such as the Percentage of Glottic Opening (POGO) score and Cormack–Lehane grading, this study seeks to provide insight into the effectiveness of VL in a controlled operative setting.

MATERIAL AND METHODS

Study Design

This study is designed as a Prospective descriptive observational study conducted in a controlled operative setting to evaluate the intraoperative ease of using videolaryngoscopy and its efficacy in using it as a surgical tool as well as the glottic exposure provided by it.

The study was carried out in the operating theatres of a tertiary care hospital over 18 months. All procedures were performed after obtaining informed consent, under general anaesthesia as a part of routine surgical care.

Study Population and Sample Size

A total of **74 patients** requiring laryngoscopy for elective surgical procedures are included in the study.

Inclusion Criteria

- Patients aged ≥18 years and patients undergoing elective surgery requiring laryngoscopic exposure were included in the study

Exclusion Criteria

- Patients undergoing laser surgery, cordectomy for malignancies are excluded from the study

Video laryngoscope

All laryngoscopies were performed using the BESDATA video laryngoscope (4) (Figure 1)**.** This device utilises video technology with a camera positioned near the distal end of the laryngoscope blade, (Figure 2) transmitting real-time images to a video display on a 3inch LCD monitor, rotatable front and back 0°-130°. It has a recording and storage facility. The camera has a resolution of 1280x720px [HD] with smart antifog white LED light at blade tip for better visualisation and with rechargeable battery and charger. Besdata offers both reusable metal blades and disposable blades, we have used the reusable blades with different sizes with moderate curvature. For Neonates, miller 0, <8cm length is available. For paediatric MAC 1 [Macintosh styled curved blade] with a length of 10.45cm is available, for adults Mac 2-4 blades with lengths of 12.11cm, 14.25cm, 16.08cm is available. For difficult airway scenarios, D-Blade with hyper-angulation is used to improve the glottic view [4].

Figure 1: Besdata Laryngoscope with video camera and blades.

Figure 2: Videolaryngoscope with MacIntosh blade no 4 with camera

Technique

General anaesthesia was administered and after adequate muscle relaxation, patients were positioned in the sniffing position. The BESDATA video laryngoscope blade was gently inserted along the midline of the oral cavity.

The blade was advanced until the epiglottis and glottic structures were visualised on the video screen with one hand. Malleable surgical instruments were used for excision of the lesion with the other hand. No excessive lifting force or

cervical spine manipulation was applied beyond routine external laryngeal manipulation. All laryngoscopies were performed by the senior author to minimise operator-related variability.

Assessment of Glottic Visualisation

Percentage of Glottic Opening (POGO) Score

Glottic exposure was assessed using the **Percentage of Glottic Opening (POGO) score**, which quantifies the proportion of the glottic opening visualised during laryngoscopy (Figure 3)**.**

POGO scores were categorised as: **75-100%**: Excellent glottic visualisation, **50-75%**: Good glottic visualisation, **25-50%**: Poor glottic visualisation [5].

The score was recorded at the point of maximum glottic exposure achieved intraoperatively.

Cormack–Lehane (CL) Grading

The laryngoscopic view was also assessed using the **Cormack–Lehane grading system**, defined as: **Grade I**: Full view of the glottis, **Grade II**: Partial view of the glottis, **Grade III**: Only epiglottis visible, **Grade IV**: Neither glottis nor epiglottis visible [6] (Figure 3)**.**

The CL grade was documented for each patient based on the best view obtained during videolaryngoscopy.

Outcome Measures

The primary outcome measures included:

- Quality of glottic exposure as assessed by POGO score
- Laryngoscopic view graded using the Cormack–Lehane classification

Secondary outcome measures included:

- Ease of intraoperative exposure as subjectively assessed by the operating surgeon
- Need for external laryngeal manipulation or adjunct instruments
- Surgical feasibility

RESULTS

A total of 74 patients underwent laryngeal surgeries with video laryngoscope as a surgical tool. A total of 46 patients underwent vocal cord polyp excision, (Figure 4 A and 4B) 09 patients underwent vocal cord cyst excision, 17 patients had premalignant lesions and underwent biopsies from various laryngeal sites, 2 patients had supraglottic lesions where 1 patient had epiglottic cyst along with vocal polyp and the other patient had multiple hemangiomas in base of tongue and epiglottis and underwent sclerotherapy for the same, twice in the span of 2 months. Of the 74 patients, 11 of them had bilateral lesions and for 3 patients, the histopathology was not reported because of the scanty tissue. The lesion was completely excised intraoperatively in the scanty specimen patients and none of them required repeat surgeries nor had recurrence on follow up.

All procedures had good glottic visualisation with 75-100% exposure with POGO scoring and grade 1 of Cormack-Lahane grading which is significantly good outcome. Few patients with lesion near the anterior commissure, the single-handed access was challenging, in such cases the extra attention was given to external laryngeal pressure and the malleable instruments had to be adjusted repeatedly until the lesion was reached. None of the patients had residual lesion or recurrences, the post-operative healing was good with satisfactory voice improvement at 3 months.

None of the patients complained post operative cervical pain or teeth pain. No patients had injuries to the lip or supraglottic structures, thyroid cartilage pressure was not required in most patients, and since the time taken for exposure was minimal, the operative time was also less compared to our microlaryngoscopic phonosurgeries.

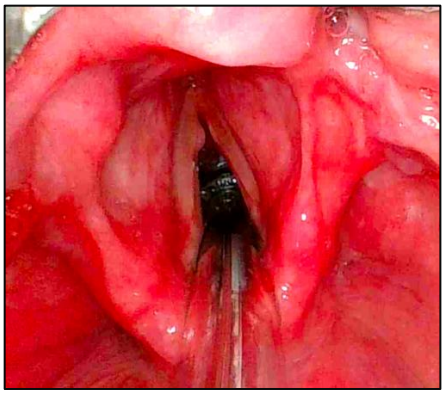

Figure 3: Larynx visualization with videolaryngoscope

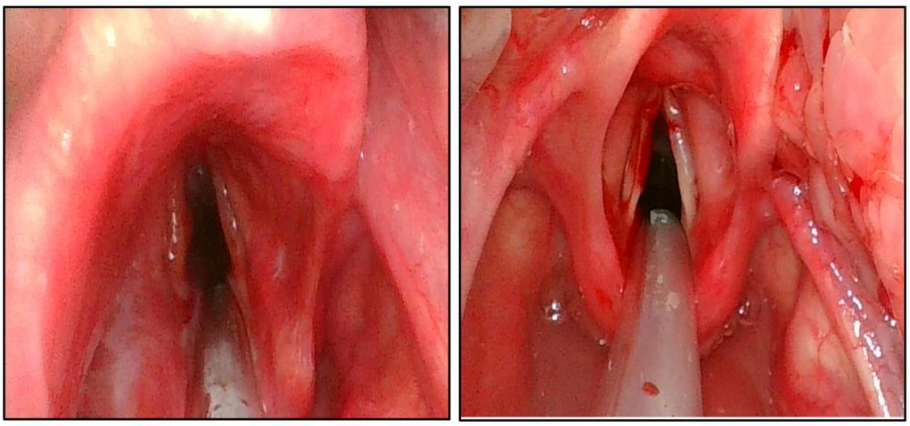

Figure 4A: Pre op left vocal cord polyp

Figure 4B: Post excision of left vocal cord polyp

DISCUSSION

Videolaryngoscopy represents a significant advancement in airway visualisation and laryngeal surgery. The principal advantage of VL lies in its ability to provide adequate visualisation of the glottis and surrounding airway structures through the use of high-resolution micro-cameras positioned near the tip of the laryngoscope blade [5,7]. This proximity to the laryngeal inlet allows a wider field of view compared to direct laryngoscopy, particularly when hyper-angulated (HA) blades are used [1,5,7]. In the present study, improved glottic exposure was reflected by higher POGO scores, with a substantial proportion of cases achieving 75-100% glottic visualisation.

Unlike direct laryngoscopy, which relies on alignment of the oral, pharyngeal, and laryngeal axis as described by the three-axis alignment theory or flattening of the primary and secondary curves described in the two-curve theory, videolaryngoscopy provides an indirect view of the glottis [1,2]. This eliminates the need for excessive cervical spine manipulation and reduces the force required to lift the epiglottis [1,8,9]. Consequently, VL is particularly advantageous

in patients with anticipated difficult airways, including those with limited cervical spine mobility, obesity, short neck, retrognathia, or other anatomical variations that complicate direct laryngoscopy [1].

An additional advantage of videolaryngoscopy is its positive impact on non-technical skills. The shared visual display enables improved communication and coordination among the multidisciplinary team [1,10,11]. Anaesthetists, surgeons, and assistants can simultaneously visualise the airway, allowing anticipation of equipment needs, optimisation of external laryngeal manipulation or cricoid pressure, and better understanding of anatomical or pathological challenges [1]. This shared view also enhances training, as supervisors can guide learners in real time, thereby improving skill acquisition and procedural safety.

Studies have shown that operators with greater experience in VL demonstrate higher first-pass success rates [1,9,12]. Despite these benefits, superior glottic visualisation does not always translate into easier surgical access or instrument handling at the level of the vocal cords since it is a single -handed surgery which is challenging (Figure 5). We have used malleable MLS instruments for the ease of single-handed surgeries. Limitations such as reduced depth perception and the need for adjunct or malleable instruments must be acknowledged.

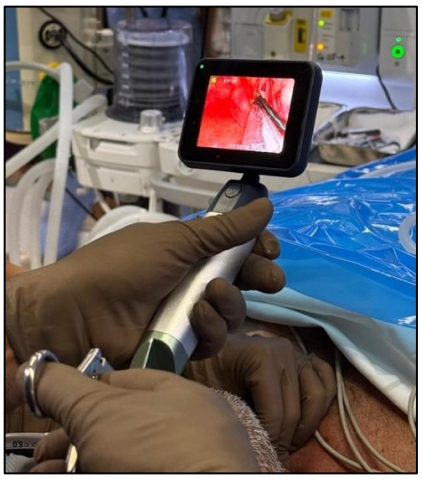

Figure 5: Single hand technique with malleable instrument

As per our experience, the surgical procedures like benign vocal cord lesion excision, biopsy of the supraglottic, glottic and subglottic lesions have been successfully performed. The challenging difficult exposure cases with direct laryngoscopy were also performed with ease by videolaryngoscopy with adequate exposure. The incidences of teeth and jaw trauma, trauma to the supraglottic structures, neck pain due to extensive laryngeal pressure as seen in difficult exposure cases with direct laryngoscope is also absent with less intraoperative time taken for visualisation even for challenging laryngeal exposure cases.

In our experience, videolaryngoscopy has been an excellent surgical tool for benign glottic and subglottic lesions with short surgical time due to high first pass success rate, with no need of fixation with suspension laryngoscope. The post op recovery was good with no complications and no recurrences were seen. However, use of it for malignancies, respiratory papillomatosis and in cases where laser assisted excision is required, needs further evaluation. Therefore, appropriate device selection, standardisation of equipment within institutions, and dedicated training in both Macintosh and hyper-angulated VL techniques are essential for optimal outcomes.

CONCLUSION

Videolaryngoscopy is a safe, effective, and practical surgical tool for intraoperative laryngeal procedures, particularly in benign supraglottic, glottic and subglottic lesions. The use of the BESDATA video laryngoscope provided consistently excellent glottic visualisation, with all cases achieving high POGO scores (75–100%) and Cormack–Lehane Grade I views. The enhanced visual exposure translated into satisfactory surgical feasibility, minimal need for external manipulation, reduced operative time, and absence of procedure-related complications.

Overall, videolaryngoscopy appears to be a reliable alternative to conventional suspension microlaryngoscopy for benign laryngeal pathologies. However, its role in complex malignant lesions, laser-assisted procedures, and vascular or papillomatous conditions requires further prospective evaluation with larger sample sizes. Standardised training and appropriate device selection remain essential to optimise surgical outcomes.

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