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Original Article

Comparison of TruView and King Vision video laryngoscopes in subaxial cervical spine injury: A randomized controlled trial

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ABSTRACT

Background: Airway management with cervical spine immobilization poses a particular challenge for intubation in the absence of neck extension and risks neurological damage in cases of unstable cervical spine injuries. Here, with manual inline stabilization (MILS) in patients with cervical spine injuries, we compared the safety/efficacy of intubation utilizing the TruView versus King Vision video laryngoscopes.

Methods: This prospective, single-blind, comparative study was conducted over a 3-year period. The study population included 60 American Society of Anesthesiologists (ASA) Grade I-III patients, aged 18–65 years, who underwent subaxial cervical spine surgery utilizing two intubation techniques; TruView (TV) versus King Vision (KV). For both groups, relative intubation difficulty scores (IDS), total duration of intubation, hemodynamic changes, and other complications (e.g., soft-tissue injury and neurological deterioration) were recorded.

Results: With MILS, patients in the KV group had statistically significant lower IDS (0.70 ± 1.02) and significantly shorter duration of intubation as compared to the TV group (1.67 ± 1.27) with MILS ($P = 0.0010$); notably, the glottic exposure was similar in both groups. The complication rate (e.g., soft-tissue injury) was lower for the KV group, but this was not statistically significant. Interestingly, no patient from either group exhibited increased neurological deterioration attributable to the method of intubation.

Conclusion: King Vision has several advantages over TruView for intubating patients who have sustained cervical spine trauma. Nevertheless, both laryngoscopes afford comparable glottic views and safety profiles with similar alterations in hemodynamics.

Keywords: Airway management, Cervical spine, Intubation, Video laryngoscope.

INTRODUCTION

Manual in-line axial stabilization (MILS) is used for airway management where other stabilization methods are inappropriate.[7] The TruView (TV) EV02 (TruView PCD™ 4150, Truphatek International Ltd., Netanya, Israel) is an optical laryngoscope that gives 42° deflection view through a 15 mm eyepiece; it provides wider angle of vision even in neutral position. The King Vision [10] (KV) video laryngoscope (KVL03C, King Systems Corporation, Germany)

ensures optimum quality images of the vocal cords, has two types of blades, and can accommodate an endotracheal tube between 6.0 and 8.5 mm ID [Figure 1].

This pilot study compared the safety/efficacy of tracheal intubation utilizing the TV and KV when combined with MILS in patients with subaxial cervical spine trauma [Figures 2 and 3].

MATERIALS AND METHODS

This was an IRB approved, randomized prospective, single-blind, comparative study conducted over a 3-year period (January 2017–December 2019) at tertiary care spinal injuries center [Figure 4]. All patients were analyzed by the same anesthetist who is also the lead author of this paper to ensure no bias. Demographic variables, airway assessment, and ASA grading were noted preoperatively. The study population included 60 patients of ASA I-III, aged 18–65 years undergoing subaxial cervical spine surgery under general anesthesia. [Table 1].

Anesthetic techniques

Routine induction was performed in both population groups. MILS was applied to hold the mastoid process and side of the neck in position preventing any movement (flexion, extension, or rotation) of the neck. After mask ventilation for 2 min, laryngoscopy and orotracheal intubation were performed by an experienced anesthetist (at least 5 years) utilizing the TV or KV instruments. All intubations were carried out with size 3 blade for both the laryngoscopes. The total duration of intubation was visually confirmed by the anesthetist, and successful tube placement was confirmed utilizing routine modalities (e.g., capnography/end-tidal CO_2). Complications during intubation including soft-tissue injuries were recorded.

Statistical analysis

The sample size was measured with the pooled standard deviation of IDS from the past studies as 2.75 and two-sample *t*-tests were applied using the formula $(\mu_1-\mu_2)/SD = 0.88$. Using the following cutoff values of α as 0.05 and ß as 0.20 (or 80% power), a minimum required sample of 30 in each group was estimated. Quantitative variables (e.g., airway examination, IDS, number of attempts, and complications) were compared using Mann–Whitney test and Chi-square test. Hemodynamic alterations were compared using unpaired and paired *t*-tests. All results were analyzed using SPSS software version 23.0.

RESULTS

Our study included 60 subjects; 30 in either group, who had sustained subaxial cervical spine injuries resulting

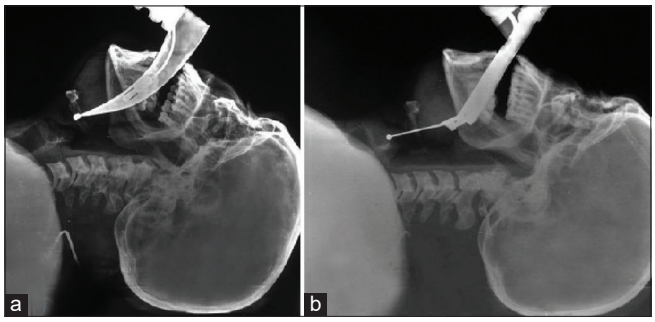

Figure 1: Lateral view of cervical spine using Macintosh (a) and TruView (b) laryngoscope.

Table 1: Exclusion criteria.

Patients with ASA grade >3
Difficult airway because of trauma to airway or blood in airway or reduced mouth opening <3 cm
Mallampati class (MPC) grade > III or congenital anomalies
Patients with buck teeth, edentulous jaw, loose teeth
Patients who required emergency intubation and rapid sequence intubation
Patients with injury to supra-axial cervical spine

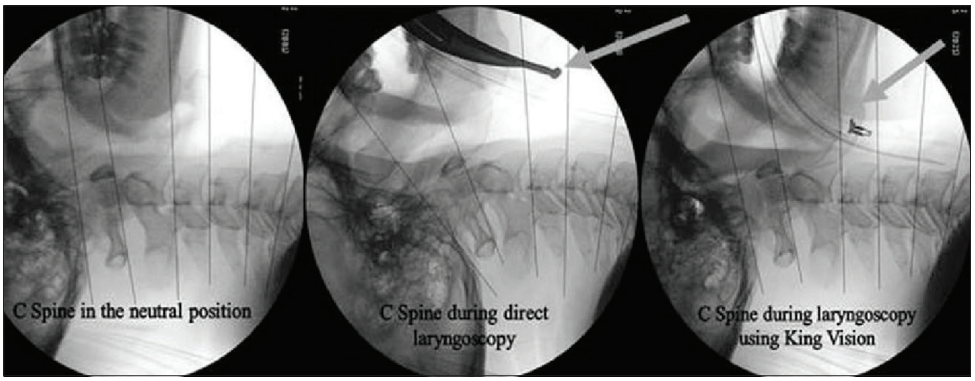

Figure 2: Lateral X-ray view of the cervical spine with Macintosh direct laryngoscope and King Vision video laryngoscope showing amount of extension required at cervical spine for intubation.

in comparable preoperative neurological deficits [Tables 2 and 3]. Cases were classified into five age groups at 10-year intervals [Table 4]. They exhibited comparable variables regarding sex distribution, ASA presenting grades, and upper lip bite texts.

Figure 3: The King Vision video laryngoscope and Truphatek-TruView PCDTM laryngoscope.

With MILS, patients in the KV group had statistically significant lower IDS (0.70 ± 1.02) and significantly shorter duration of intubation as compared to the TV group (1.67 ± 1.27) with MILS (p = 0.0010) [Table 5]. Notably, the glottic exposure was similar in both groups. The complication rate (e.g., soft-tissue injury) was lower for the KV group, but this

Table 2: Level of injury in patients.

	TV	KV
C3	5	7
C4	4	6
C5	5	7
C6	10	5
C7	6	5

TV: TruView, KV: King Vision

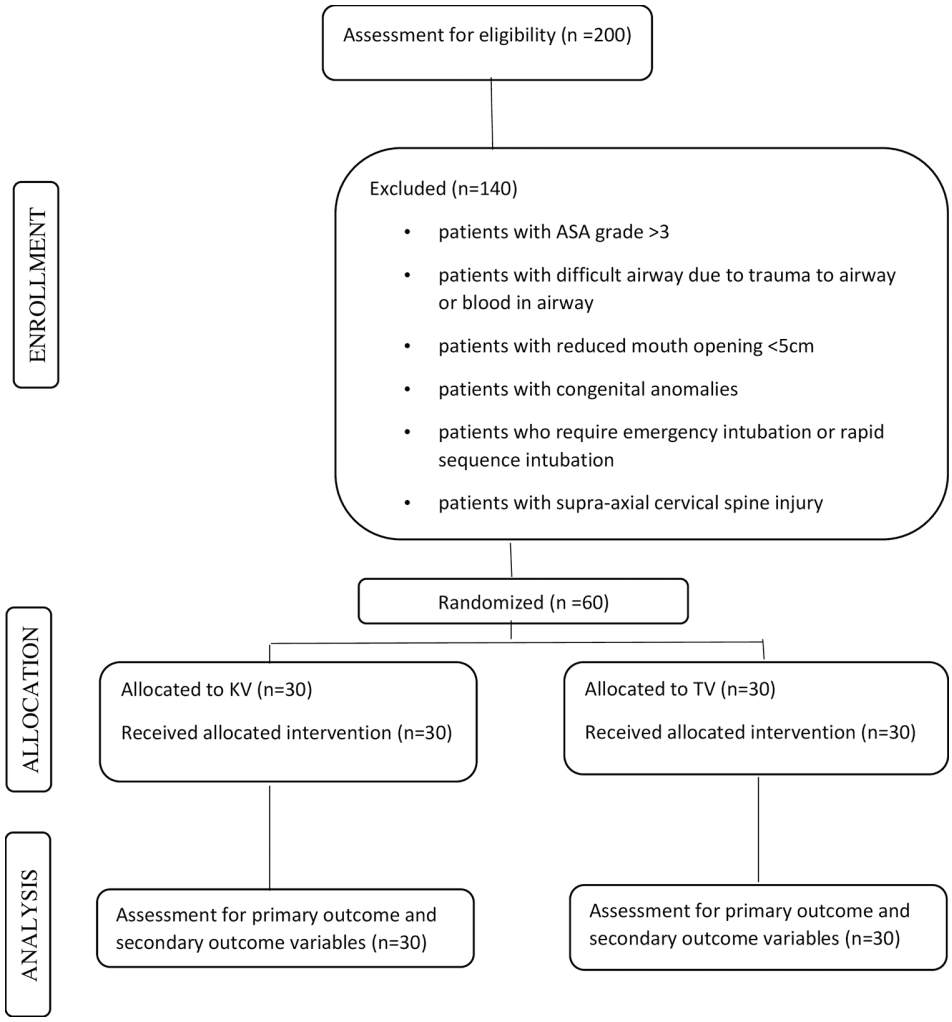

Figure 4: Flowchart showing distribution of patient population.

was not statistically significant. Interestingly, no patient from either group exhibited increased neurological deterioration attributable to the method of intubation. The initial mean HR 1 min before intubation was higher in the KV group versus the TV group [Table 6]. The differences regarding increases in MAP with laryngoscopy and intubation were not statistically significant at each measured interval for the two groups [Table 7].

Table 3: Neurological status of patients in (TV: TruView and KV: King Vision group).

Neurology status	TV	KV
ASIA A	2	1
ASIA B	7	6
ASIA C	11	12
ASIA D	7	8
ASIA E	3	3

Table 4: Demographic and ASA distribution among groups.

	Group KV	Group TV	*P* value
Age (years) (mean±SD)	44.07±17.60	48.27±15.89	0.336
Weight (kg) (mean±SD)	60.10±9.38	64.27±8.23	0.073
Gender			
Male	24 (80%)	26 (86.7%)	0.488
Female	6 (20%)	4 (13.3%)	
ASA classification			
ASA I	8 (26.7%)	5 (16.7%)	0.286
ASA II	10 (33.3%)	16 (53.3%)	
ASAIII	12 (40%)	9 (30%)	
Mallampati class			
MPC I	9 (30%)	6 (20%)	0.063
MPC II	10 (33.3%)	15(50%)	
MPC III	11(36.6%)	9 (30%)	
Upper lip bite test (ULBT) score			
ULBT I	28 (93.3%)	26 (86.7%)	0.584
ULBT II	1 (3.3%)	3 (10%)	
ULBT III	1 (3.3%)	1 (3.3%)	

TV: TruView, KV: King Vision

Table 5: Comparison of different measures of ease of intubation among groups.

	Group KV	Group TV	*P* value
IDS (Mean±SD)	0.70±1.02	1.67±1.27	0.001 (Mann–Whitney U-test)
Easy (IDS=0)	17 (56.7%)	6 (20%)	0.007
Time of intubation (seconds)	25.98±14.93	39.74±19.07	0.002 (independent *t*-test)
Subjective lifting force: normal	29 (96.66%)	22 (73.33%)	0.026
Subjective lifting force: elevated	1 (3.33%)	8 (26.66%)	

TV: TruView, KV: King Vision

DISCUSSION

Managing airway with MILS is very difficult task for an anesthesiologist in patients with cervical spine injuries during resuscitation, administration of general anesthesia, and respiratory support. The TV laryngoscope and KV video laryngoscope are two indirect laryngoscopes each with an advanced optical technology.

Bhardwaj *et al*.[2] found less neck movement occurring during laryngoscopy utilizing the TV versus Macintosh laryngoscope. El Tahan *et al*.[5] concluded that laryngoscopy with KV resulted in significantly less C0–C1 and C3–C4 segments motion with reduced cumulative upper cervical spine motion from C0 to C4. Prior studies done by Ali *et al*.[1] and Bharti *et al*.,[3] respectively, have shown that KV and TV significantly improve laryngoscopic view as compared to

Table 6: Comparison of heart rate among groups KV and TV.

Variable	Group	Mean±SD	*P* value
Heart rate (baseline)	KV	83.53±15.68	0.243
	TV	79.03±13.80	
HR1	KV	94.33 vs. 16.00	0.377
	TV	90.50±17.35	
HR2	KV	90.70±15.11	0.360
	TV	89.03±16.40	
HR3	KV	87.40±13.36	0.214
	TV	82.56±16.31	
HR4	KV	86.10±12.74	0.310
	TV	82.23±16.31	
HR5	KV	84.07±11.58	0.106
	TV	77.20±19.71	

TV: TruView, KV: King Vision

Table 7: Comparison of MAP among groups KV and TV.

Variable	Group	Mean±SD	*P* value
Mean arterial pressure (MAP) (baseline)	KV	89.87±14.06	0.947
	TV	90.13±16.79	
MAP1	KV	95.17±14.24	0.780
	TV	96.33±17.74	
MAP2	KV	93.67±12.53	0.291
	TV	97.90±17.78	
MAP3	KV	89.43±12.71	0.426
	TV	92.17±13.66	
MAP4	KV	85.37±11.59	0.877
	TV	84.83±14.70	
MAP5	KV	84.20±10.06	0.882
	TV	84.70±15.33	

TV: TruView, KV: King Vision, MAP: Mean arterial pressure

Macintosh and McCoy in cervical spine immobilization. We additionally found that KV gives better IDS versus TV EVO2 ($P = 0.0001$). We found that the average intubation time was significantly less with the KV versus TV. The blade of the KV is designed in such a way that it coincides with the anatomical curvature of the oropharynx making it easier to insert with MILS. However, Priyanka *et al*.[6] had contrary findings; the KV took significantly more time than the TV for intubation.

The more anatomically fitting design of the KV laryngoscope allowed lessor vertical force to achieve glottic alignment as compared to the TV, which resulted in lesser dental and soft-tissue injury versus TV. Further, the differences of rise in heart rate as well as MAP between the two groups were not statistically significant.

Although both the laryngoscopes provided good glottic view, the KV was slightly better (e.g., ease of insertion with MILS, shorter intubation time, less soft-tissue injury, and reduced hemodynamic changes). The KV further has a provision of disposable blade which removes the concerns of contagious infections.[4] Finally, there were no significant changes in neurological status between the two groups utilizing KV versus TV, thus highlighting the safety of the procedure.

CONCLUSION

King Vision has several advantages over TruView for intubating patients who have sustained cervical spine trauma. Nevertheless, both laryngoscopes afford comparable glottic views and safety profiles with similar alterations in hemodynamics.

Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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Conflicts of interest

There are no conflicts of interest.

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