A Comparative Evaluation of Truview and Macintosh Laryngoscopes for Tracheal Intubation

Sagar N. Kolli*, Hemangi S. Karnik**, Devangi A. Parikh***, Bharati A. Tendolkar****

Abstract

Introduction: **Truview EVO2 is a modified laryngoscope that provides a 42° anterior view facilitating visualisation of the glottis without alignment of oropharyngeal and tracheal axes. We compared laryngoscopic view, intubation ease and haemodynamic parameters of Truview with the conventional Macintosh laryngoscope.**

Methods: **Two hundred patients undergoing elective surgeries were randomised into two groups to undergo tracheal intubation with either Truview or Macintosh laryngoscopes. The glottic view, need for external laryngeal manipulation, time taken for laryngoscopy, resuming effective ventilation, number of attempts, haemodynamic parameters and complications were evaluated.**

Results: **Truview showed better results for glottic view (90% grade I, 10% grade II Vs 61% grade I, 38% II and 1% III with Macintosh) ($p < 0.0001$) and requirement of external laryngeal manipulation (11% Vs 22%; $p = 0.046$). However, it required longer time for laryngoscopy (18.90 ± 12.33 seconds Vs 15.30 ± 05.43 seconds; $p = 0.044$) and resuming effective ventilation (45.45 ± 25.02 seconds Vs 26.77 ± 13.17 seconds; $p = 0.008$). Significantly more number of patients required more than one attempt with Truview (86% first, 12% second, 2% > 2 attempts Vs 98%, 1%, 1% with Macintosh). Haemodynamics were comparable between the groups. The incidence of sore throat was similar. Lip and gum injuries were higher in the Truview group.**

Conclusion: **Truview laryngoscope provides excellent glottic view compared to Macintosh with similar changes in haemodynamics. However, time taken for intubation was longer with Truview.**

Introduction

The curved Macintosh laryngoscope remains the most popular device among the anaesthesiologists to successfully intubate the trachea.[1] The equipment requires alignment of oropharyngeal and laryngeal axes for visualisation of vocal cords along with specific head and neck positioning. Though there are many predictors of difficult airway, sometimes difficult intubations are realised only after anaesthesia induction and their incidence is high 1.5-13%.[2,3] Among various difficulties, inability to view the glottic opening on laryngoscopy is the most common problem faced by all. Complications arising from difficult or failed intubation remain a leading cause of anaesthesia related morbidity and mortality.[4,5]

*Assistant Professor, **Professor, ***Associate Professor, ****Professor and Head of Dept., Lokmanya Tilak Municipal Medical College and Lokmanya Tilak Municipal General Hospital, Sion, Mumbai-400 022.

In recent years, different laryngoscopes have been developed to facilitate ease of intubation. Truview EVO2® laryngoscope[6] developed by Truphatek International Ltd, Netanya, Israel is a modified laryngoscope with an inexpensive telescope angled at approximately 42° anteriorly with the blade so that the glottis can be visualised through an unmagnified visual port involving 15 mm eye piece, without having to bring oral and pharyngeal axes in alignment. It also has added features like attached digital camera for easy viewing and oxygen insufflation attachment. It helps to improve the view of the glottis by one to two grades, thus may be helpful in difficult intubation cases. It is found to be associated with reduced lifting force, reduced laryngoscopy and intubation time and stable haemodynamics.[7]

The present study was conducted to compare Truview and Macintosh laryngoscopes for tracheal intubation in 200 patients undergoing elective surgeries. The best glottic view obtained, ease of intubation, haemodynamic parameters and incidence of complications have been compared between the two laryngoscopes.

Methods

After approval from the institutional ethics committee, the present study was conducted in 200 ASA I and II patients of either sex between 20 and 60 years of age, weighing between 40 and 80 kg, scheduled to undergo elective surgery under general anaesthesia and tracheal intubation. Written, informed consent was obtained from all patients to participate in the study. Patients unwilling for consent, obesity with BMI > 30, thyromental distance < 6 cm or any factor predicting difficult intubation, edentulous patients, patients on sedatives or beta blockers, anticipated haemodynamic instability and pregnant patients were excluded from the study. All the patients were examined a day before surgery and were thoroughly investigated according to the institute protocol. Patients selected were randomised into 2 groups using computer generated randomised chart; Group T (n = 100) in whom Truview laryngoscope was used and group M (n= 100) in whom Macintosh laryngoscope was used.

On arrival in the operation theatre, after confirming adequate starvation, patient's heart rate, arterial blood pressure, oxygen saturation and ECG were monitored (PM-9000 Express, Penlon, Abingdon, UK). Intravenous access was secured with 20G cannula and Ringer's lactate solution at 2 ml kg^{-1} was started. All patients in the study were premedicated with intravenous glycopyrrolate 0.004 mg kg^{-1}, fentanyl 2 g kg^{-1}, midazolam 0.02 mg kg^{-1}, ranitidine 1 mg kg^{-1} and ondansetron 0.08 mg kg^{-1}. After preoxygenation with 100% oxygen for 3 minutes using circle absorber system with capnograph attached, anaesthesia was induced with intravenous thiopentone sodium 4-6 mg kg^{-1} till loss of eyelash reflex. Neuromuscular blockade was achieved with intravenous suxamethonium 1.5 mg kg^{-1}. Laryngoscopy was then performed at 60 seconds with one of the laryngoscopes as per group randomisation. In group M, in

supine, "sniffing morning air" position, conventional laryngoscopy was performed using Macintosh laryngoscope with blade size either 3 or 4 as per discretion of the chief anaesthesiologist and tracheal intubation was done under direct vision. In group T, with the patient's head in neutral position, Truview laryngoscope (adult size) with a digital camera and 8-10 litres oxygen flow attached, was inserted along the right tongue border till visualisation of epiglottis. Then a caudal pressure was applied towards the lower jaw to bring the larynx in the view. A tracheal tube was inserted with stylet under laryngoscopic view obtained on the camera lens. All intubations were performed by an anaesthesiologist with atleast 2 years of experience and ten intubations using Truview laryngoscope.

Time required for laryngoscopy (defined as the time from taking the face mask off till optimum laryngoscopic view of the glottis is attained) was noted. Time required for resuming effective ventilation was also noted. (i.e. time from taking face mask off till reconnection of the circuit to the tracheal tube, giving first IPPV and recording square waveform on capnograph). Best glottic view achieved was graded as per Cormack-Lehane grading criteria[8] (grade 1 most of the glottis is visible, grade 2, only the posterior extremity of the glottis is visible, grade 3, only the epiglottis is visible, grade 4, not even the epiglottis is seen). External laryngeal manipulation was provided whenever required to obtain satisfactory laryngeal view (C and L grading I or II) and its incidence was noted. Oxygen saturation was continuously monitored and if it was below 95% in any patient, the laryngoscope was withdrawn and the patient was oxygenated with bag mask ventilation. Each attempt of intubation was restricted to maximum 90 seconds so that effective ventilation is achieved within two minutes. No more than two attempts were allowed and it was considered as failure to intubate and was noted. The patient was then intubated as per discretion of chief anaesthesiologist. Anaesthesia was continued with infusion of propofol and intermittent doses of vecuronium after intubation and the monitoring was continued for 20 minutes. Haemodynamic parameters in the form of heart rate and systolic blood pressures were noted at the time of induction, every two minutes till 10 minutes, then at 15th minute and 20th minute. Thereafter anaesthesia management was done as per the anaesthesiologist's choice and surgery was commenced.

Incidence of intubation related complications like hypoxia, laryngospasm, arrhythmia, lip trauma, oropharyngeal bleeding and postoperative sore throat or airway oedema, if any was noted.

Data analysis was done by using SPSS version 16.0. Continuous variables were tested using paired and unpaired t test for within and between group comparisons respectively. Categorical variables were tested using Pearson's Chi square test. Continuous data are presented as mean (standard deviation, (S.D.) and categorical data are presented as number and frequencies. For all statistical comparisons in this study, $p < 0.05$ was

taken as significant.

Results

Two hundred patients were recruited. No assigned patients dropped out of the study. Patient characteristics were comparable between two groups (Table 1).

Table 1: Patient characteristics. Data expressed as Mean ± SD or number (proportion)

Parameters	Macintosh (n=100)	Truview (n=100)
Age (years)	36.28 ± 11.47	34.51 ± 11.16
Range	20 - 60	20 - 60
Weight (kg)	56.00 ± 07.32	54.36 ± 07.19
Range	40 - 68	40 - 70
Gender		
Male	47 (47.0)	44 (44.0)
Female	53 (53.0)	56 (56.0)

p > 0.05 Not Significant

Intubation variables are summarised in Table 2. Better glottic view was obtained in group T, with 90% of patients having Cormack Lehane grade I view and 10% grade II as compared to 61% grade I, 38% grade II and 1% grade III in group M ($p < 0.0001$). External laryngeal manipulation (ELM) to get a satisfactory laryngeal view was required in 22% of patients in group M in comparison to 11% of patients in group T ($p = 0.046$). Even in most of these 11% cases, the ELM was provided to further improve the grading or centralise the view to facilitate tracheal intubation. Time taken for laryngoscopy was significantly longer in group T (18.90 ± 12.33 seconds) in comparison to group M (15.30 ± 05.43 seconds) ($p = 0.044$). Similarly intubation using Truview laryngoscope needed statistically and clinically longer time for resuming effective ventilation (45.45 ± 25.02 seconds vs 26.77 ± 13.17 seconds) ($p = 0.008$) than group M. Ninety eight percent of patients could be intubated in first attempt in group M, which was significantly more as compared to group T where first attempt was successful in only 86 percent. Twelve percent patients required second attempt with the Truview blade while only one patient was intubated in second attempt with the Macintosh blade. One patient in group M and two patients in group T required more than 2 attempts, though the difference was not significant.

Table 2: Intubation variables. Data expressed as Mean ± SD or number.

Parameters	Macintosh (n=100)	Truview (n=100)	p value
Cormack Lehane grade (I/ II/ III)	61/ 38/ 1	90/ 10	<0.0001
External laryngeal manipulation (Y/N)	22/ 78	11/ 89	0.046
Time taken (sec) for: laryngoscopy	15.30 ± 5.43	18.90 ± 12.33	0.044
resuming effective ventilation	26.77 ± 13.17	45.45 ± 25.02	0.008
No. of attempts (first/second/ >2)	98/ 1 /1	86/ 12/ 2	< 0.05

Among the twelve patients in the Truview group who required second attempt of laryngoscopy and intubation, there was poor visibility with the digital camera in three patients. These patients could be intubated in the second attempt when camera was removed and viewed directly through the eyepiece. In three patients, there was less space for passing the endotracheal tube because of the bulky laryngoscope blade relative to their mouth opening, creating difficulty for passing the tube in the first attempt. In

two patients, there were technical problems like the camera automatically shutting off or it coming in the way of passing the tube, requiring second attempt. In two patients, there was accidental disconnection of the auxiliary oxygen supply resulting in fogging of the lens and obscuring the view. These patients were easily intubated in second attempt with the oxygen supply reconnected. In two patients, even though the glottic view was easily achieved, tube could not be negotiated through the vocal cords as it kept on sliding posteriorly. These two patients could be intubated in the second attempt when the tube was bent more anteriorly into hockey stick configuration. However in two patients, even with these manipulations, tube could not be negotiated through the vocal cords due to overhanging epiglottis. Intubation in these patients was achieved with the McCoy laryngoscope later on. Similarly in group M one patient could not be intubated due to overhanging epiglottis and patient was intubated using McCoy laryngoscope.

Compared to baseline, there was a significant increase in heart rate after laryngoscopy and intubation, maximum rise being noted at 0 minute (at the time of laryngoscopy) in both the groups($p > 0.05$). After that, a gradual decrease was noted and by twenty minutes, the difference from baseline was clinically non significant (Fig. 1). There was significant increase in systolic blood pressure from the baseline after laryngoscopy and intubation which returned to near baseline values by 6th minute in both the groups ($p > 0.05$). Increase in heart rate and systolic blood pressure was comparable between the two groups ($p < 0.05$) (Fig. 2).

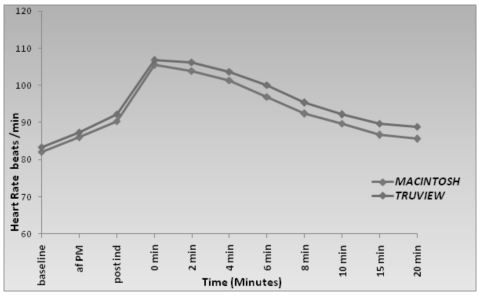

Fig. 1: Changes in heart rate over a period of time. Time '0'min is at laryngoscopy.

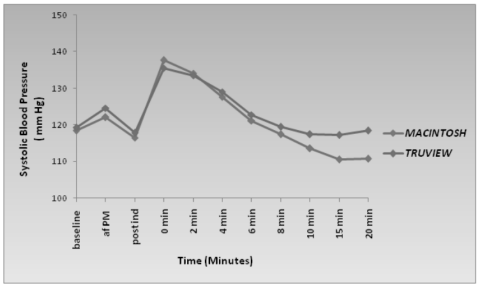

Fig. 2: Changes in systolic blood pressure over a period of time. Time '0' is at laryngoscopy.

Nine patients in both the groups complained of sore throat when asked, which subsided after few hours following supplementation of humidified oxygen by face mask. Six patients in group T had minor lip and gum injuries as compared to three in group M. No major adverse events were noted in this study (Table 3).

Table 3: Incidence of complications. Data expressed as number (proportion)

Complications	Macintosh (n=100)	Truview (n=100)
Sore throat	9(9%)	9(9%)
Injuries	3(3%)	6(6%)

Discussion

The Truview EVO2 laryngoscope was designed to improve the view of the larynx. It applies the optical principle of light refraction to provide a field of vision

spanning 42° anterior from the proximal scope end of the laryngoscope. This results in a better view of the glottis with a significantly reduced lifting force. On the contrary, Macintosh laryngoscope can provide a maximum of 30° anterior view of structures at its tip. This also requires a greater lifting force, but still, adequate glottic view is not guaranteed.

This has been demonstrated in our study where the glottic view was significantly better in the Truview group, with 90% of patients having Cormack Lehane grade I as compared to Macintosh group where only 61% were grade I ($p < 0.001$). This result is consistent with studies by various other authors as well.[9-12] Also, similar results were noted with laryngoscopes with a built-in optic apparatus and design as the Truview laryngoscope using the same optical principle.[13-16] As the Truview laryngoscope provides an anterior view, it should ideally eliminate the need for additional force or external laryngeal manipulation to achieve satisfactory glottic view. Though significantly lesser than with the Macintosh blade, we are still required to provide external laryngeal manipulation in 11% patients with the Truview laryngoscope. This might be partly because of our relatively lesser experience with this newer instrument, longer duration of intubation and our natural tendency to manipulate larynx laterally instead of centralising the laryngoscope to obtain a better view. Besides this, Truview laryngoscope provides a limited, tunnel like view of larynx. Trying to visualise the surrounding structures commonly seen on direct laryngoscopy may also be responsible for manipulations. Xue et al[17] reported that external laryngeal pressure may be used with the Truview laryngoscope to improve the view of the glottis. The Truview blade appears to have a 9-11 mm blind spot below the blade tip which interferes with the glottic view. When the external manipulation results in a downward movement of the larynx, the upper part of the glottis, will move out of the blind spot and the Truview laryngoscope will provide an improved laryngeal view.

We required a longer time for laryngoscopy and resuming effective ventilation with the Truview (18.90 ± 12.33 and 45 ± 25.02 seconds) compared to the Macintosh laryngoscope (15.30 ± 5.43 and 26.77 ± 13.17 seconds respectively). Similar results were reported by many authors as well.[18,19] Also significantly more number of attempts were required as compared to the Macintosh laryngoscope (98% vs 86%) ($p<0.05$) though the reasons were mainly technical like poor clarity of camera, accidentally camera going off, auxiliary oxygen tubing getting disconnected and inadequate curvature of the stylet. Similar problems were also noted by Tutuncu et al[12] and Singh et al.[10] Truview laryngoscope needs to be inserted from the midline, creating difficulties with manipulation of the tongue and leaving very less space for inserting and guiding the tube from the angle of the mouth towards the midline. Laryngoscopy and intubation is performed in an indirect manner using this device. The anaesthesiologist looks through the

Truview lens and focuses on the vocal cords. Then, the tube needs to be advanced blindly until its tip enters the Truview visual field. Performing this manoeuvre requires good eye-hand coordination and some practice. Malik et al[16] noted difficulty in advancing the tracheal tube towards the view of the digital camera due to fogging of the lens which prevented easy intubation with the Truview laryngoscope. However, inspite of a 50% increase in mean intubation time overall, there was no episode of desaturation in our patients which suggests that this period of time is clinically acceptable for elective cases. This might be because of the continuous oxygen insufflation. This inference of our study has been supported by other workers.[9,11] Torun et al[20] similarly noted better maintenance of SpO_2 in the Truview group in spite of requiring longer time for intubation. There is also an added advantage of visualising the whole intubation process to facilitate teaching to novices.

Our present study, however, did not demonstrate benefit with Truview laryngoscope in terms of obtundation of cardiovascular responses to laryngoscopy and intubation similar to some other studies.[11,18,20] The reasons for this could be the longer time required for intubation, the mandatory use of an intubating stylet which corresponds to the specially designed Truview blade with a 42 degree curvature. After the tip of the precurved, styletted tube is positioned in the laryngeal aperture the intubating stylet is withdrawn. This manipulation not only prolongs intubation time, but also causes greater stimuli to the larynx and the trachea. Bucx et al[21] found that duration of laryngoscopy played an important role in the cardiovascular changes associated with tracheal intubation, whereas the force applied during laryngoscopy was weakly related to the cardiovascular changes. Khan et al[7] have shown requirement of a significantly reduced force and hence significantly lesser haemodynamic response during Truview laryngoscopy. However, the laryngoscopy time was comparable in both the groups (19.6 vs. 22.2 seconds) in their study, which probably explains lesser haemodynamic response with the Truview laryngoscope. We postulate that since the mandatory use of stylet cannot be compromised on, if the time taken could be reduced then there may be some benefit of the Truview laryngoscope in terms of lesser haemodynamic response.

The main limitation of our study was that we could not blind the anaesthetist intubating the patient. However the data analyst was blinded to the group allocation. Also elective surgeries were included, so all the patients were adequately starved. We have not evaluated the device in emergency situations where starvation is usually compromised. Considering longer time required for intubation the use of Truview in rapid sequence induction is questionable. Also trauma patients mandate manual inline stabilisation during intubation unless cervical spine injury is ruled out. Although all the intubations using Truview were carried out with head in neutral position,

in our set up with relatively inexperienced hands for this device we deferred from using it in compromised situations as safety of the patients is of prime importance. Further studies need to be carried out in difficult scenarios.

Conclusion

Truview laryngoscope provides better glottic view as compared to Macintosh laryngoscope with similar changes in haemodynamic parameters. However, longer time is needed to intubate and achieve effective ventilation. Being a complex equipment, sometimes technical problems can arise which may necessitate another attempt. The maintenance of oxygen saturation throughout the intubation process by the oxygen insufflation system is an added advantage. The incidence of intubation related complications are relatively minor and can be avoided by exerting more care.

References

1. Macintosh RR. A new laryngoscope. *Lancet* 1943; 241(6233): 205.
2. Crosby ET, Cooper RM, Douglas MJ, Doyle DJ, Hung OR, Labrecque P, et al. The unanticipated difficult airway with recommendations for management. *Can J Anaesth* 1998; 45:757-76.
3. Tse JC, Rimm EB, Hussain A. Predicting difficult endotracheal intubation in surgical patients scheduled for general anesthesia: a prospective blind study. *Anesth Analg* 1995; 81:254-8.
4. Peterson GN, Domino KB, Caplan RA, Posner KL, Lee LA, Cheney FW. Management of the difficult airway: a closed claims analysis. *Anesthesiology* 2005; 103:33-39.
5. Domino KB, Posner KL, Caplan RA, Cheney FW. Airway injury during anaesthesia. *Anesthesiology* 1999; 91:1703-1711.
6. Rai E, Ramamani, Jacob R. Truview EVO2 Laryngoscope. *J Anaesth Clin Pharmacol* 2009; 25(2):199-202.
7. Khan RM, Maroof M, Jain S, Khan FR, Madhu M. Truview EVO2 Vs Macintosh laryngoscopy: Study of cardiovascular responses and POGO scoring. *J Anaesth Clin Pharmacol* 2008; 24(3): 311-314.
8. Cormack RS, Lehane J. Dif?cult tracheal intubation in obstetrics. *Anaesthesia* 1984; 39:1105-11.
9. Li JB, Xiong YC, Wang XL, Fan XH, Li Y, Xu H, Ma Y, Deng XM. An evaluation of the Truview EVO2 laryngoscope. *Anaesthesia* 2007; 62:940-943.
10. Singh I, Khaund A, Gupta A. Evaluation of Truview EVO2 Laryngoscope in Anticipated Difficult Intubation - A comparison to Macintosh laryngoscope. *Indian J Anaesth* 2009; 53 (2):164-168.
11. Kumar N, Lamba K, Ratra M. A Randomised Study of Macintosh, Mccoy and Truview EVO2 Laryngoscopes in the Intubation Scenario: Comparison. *J Anaesth Clin Pharmacol* 2010; 26(1):64-68.
12. Tutuncu AC, Kaya G, Tunali Y, Altintas F, Dilmen OK. A comparison of the Truview EVO2 and Macintosh laryngoscope blades. *Clinics* 2011; 66(4):709-711.
13. Sun DA, Warriner CB, Parsons DG, Klein R, Umedaly HS, Moult M. The GlideScope Video Laryngoscope: a randomized clinical trial in 200 patients. *Br J Anaesth* 2005; 94(3):381-384.
14. Enomoto Y, Asai T, Arai T, Kamishima K, Okuda Y. Pentax-AWS, a new videolaryngoscope, is more effective than the Macintosh laryngoscope for tracheal intubation in patients with restricted neck movements: a randomized comparative study. *Br J Anaesth* 2008; 100 (4):544-548.
15. Maharaj CH, O'Croinin D, Curley G, Harte BH, Laffey JG. A comparison of tracheal intubation using the Airtraq or the Macintosh laryngoscope in routine airway management: a randomised, controlled clinical trial. *Anaesthesia* 2006; 61: 1093-1099.
16. Malik MA, Maharaj CH, Harte BH, Laffey JG. Comparison of Macintosh, Truview EVO2, Glidescope and Airwayscope laryngoscope use in patients with cervical spine immobilization. *Br J Anaesth* 2008; 101(5):723-730.
17. Xue FS, Yuan YJ, Liu JH. A possible explanation for cricoid pressure to improve the laryngeal

view with the Truview EVO2 laryngoscope. *Can J Anesth* 2011; 58:1146-1148.
18. Timanaykar RT, Anand LK, Palta S. A randomized controlled study to evaluate and compare Truview blade with Macintosh blade for laryngoscopy and intubation under general anesthesia. *J Anaesth Clin Pharmacol* 2011; 27(2):199-204.
19. Barak H, Philipchuck P, Abecassis P, Katz Y. A comparison of the Truview blade with the Macintosh blade in adult patients. *Anaesthesia* 2007; 62:827-831.
20. Torun AC, Tur A, Ozkan F, Kelsaka E, Karakaya D, Sarihasan B, Tortop E. Assessment of Macintosh laryngoscope and Truview EVO2 video laryngoscope with respect to hemodynamic and intubation quality in patients with presumptive difficult intubation. *J. Exp. Clin Med* 2011; 28:4-7.
21. Bucx MJ, Van Geel RT, Scheck PA, Stijnen T. Cardiovascular effects of forces applied during laryngoscopy. The importance of tracheal intubation. *Anaesthesia* 1992; 47(12):1029-1033.

Chronic Cough

Several recognisable causes of chronic cough, such as chronic obstructive pulmonary disease (COPD), pulmonary tuberculosis, sarcoidosis, interstitial lung disease, lung cancer, an inhaled foreign body, and heart failure will be obvious after clinical examination, chest radiography, and spirometry. However despite extensive investigation and treatment trials, up to 46% of patients with chronic cough have an unexplained aetiology.

Up to 75% of patients who were found to have GERD-induced cough ***do not*** have symptoms of **heartburn** or acid indigestion. Endoscopy is typically not helpful, and most patients with chronic cough and GERD ***do not*** have evidence of oesophagitis.

Because of possible pathophysiologic difference, patients with cough variant asthma are thought to represent a different phenotype from those with classic asthma. A third cough predominant eosinophilic airway disorder is nonasthmatic eosinophilic bronchitis (NAEB).

Cough that worsens when supine suggests postnasal drip, oesophageal reflux, bronchiectasis, chronic bronchitis or heart failure.

Smoking should be stopped and exposure to passive smoke eliminated in all patients. ACE inhibitors should be stopped if possible, or dose reduced; if causative, this will result in symptom relief in 2-4 weeks. Persistence of cough after withdrawal of ACE inhibitors raises the possibility of another cause of cough, such as asthma, the onset of which has been linked to the use of ACE inhibitors.

Upper airway cough syndrome may respond to removal of inhaled irritants or offending antigens, treatment of chronic sinusitis with a course of antibiotics, and weaning off topical decongestants.

Asthma (highly suspected or proven by spirometry) should be treated with inhaled corticosteroids and beta-2 agonists; a clear improvement within 1 week.

2 week trial of oral prednisolone should be given in cases of NAEB Treatment for GERD includes conservative measures (diet manipulation), drug therapy (e.g., motility or prokinetic agents, H2 antagonists, proton pump inhibitors (PPIs). A trial of treatment with acid-suppression therapy with a PPI for 2-3 months would be reasonable in patients with otherwise unexplained cough, even when there are no suggestive upper gastrointestinal symptoms.

Narcotic antitussives (codeine 8-15 mg every 4 hours) are preferred when chronic cough interferes with sleeping or eating.

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