Bilateral para-tracheal lignocaine infiltration in open surgical tracheostomy

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Abstract

Introduction
Cough during tracheostomy leads to difficult tube insertion, tracheal secretions spilling in the operative field and exposing the operating team to dangerous pathogens. We conducted a study to find the effect of bilateral para-tracheal lignocaine infiltration in suppressing cough reflex.

Material and methods
The cohort had two groups. Just before tracheotomy, group 1 had lignocaine infiltration in the bilateral para-tracheal gutter and tracheal lumen, whereas group 2 had infiltration in the tracheal lumen only. Cough reflex was recorded on a visual analogue scale and analysed statistically.

Results
Group 1 had highly significant cough reflex suppression and immediate postoperative comfort in comparison with the other group. There was also a significant difference in the late postoperative period between the two groups.

Conclusion
Lignocaine infiltration in the para-tracheal space just before tracheotomy leads to the absence of cough reflex with no exacerbation in respiratory distress. We strongly advocate the use of lignocaine in the para-tracheal space just before tracheotomy in open surgical tracheostomy.

Introduction
Tracheostomy is one of the oldest surgical methods. Its history dates back to 3600 BC and is found engraved in the Abydos and Sakkarra regions of Egypt. Tracheal opening is also mentioned in the Rig Veda, a sacred Hindu book written between 2000 and 1000 BC, and the Ebers Papyrus (1550 BC). Heister first used the word ‘tracheotomy’ in 1739 AD. Chevalier Jackson presented a detailed surgical technique of tracheostomy in 1909, and since then, this technique has advanced and saved millions of lives worldwide.

Initially, tracheostomy was a frightening procedure, but it is now performed in local anaesthesia within few minutes with negligible complications. However, cough during tracheotomy spoils the operative field and leads to surgical emphysema in some cases. This perioperative complication exposes the operating team to dangerous infectious pathogens such as hepatitis and HIV. It is advised to inject few drops of lignocaine in the trachea or infuse intravenously to suppress this reflex before tracheotomy, but this rarely helps practically. Nowadays, surgeons and assisting staff wear face and eye shields to prevent infection. However, sometimes, tracheostomy is performed by the bedside in emergency cases without providing time to wear protective gear, thereby increasing the risk of infection to the surgical team.

The trachea is innervated by the recurrent laryngeal nerve (RLN) and stimulation of these sensory fibres leads to cough; therefore, drug-induced block of these nerves can suppress cough reflex. However, this nerve block is believed to be risky and contraindicated as it leads to bilateral vocal cord paralysis and can further precipitate respiratory obstruction.

In our opinion, the trachea is secured at the time of lignocaine infiltration, and hence, any respiratory distress due to RLN block can be managed by opening the trachea immediately. With this hypothesis, we conducted a prospective, single institutional, single blind, case-control study in order to determine the effect of bilateral RLN block before tracheotomy.

Materials and methods
A prospective, single institutional, single blind, case-control study was conducted in the Department of Otolaryngology-Head & Neck Surgery of Indira Gandhi Medical College from June 2008 to December 2010. The study included 60 patients undergoing elective and emergency tracheostomy under local anaesthesia. All surgeries were performed by a single surgeon (principal author). Patients were divided into two groups consisting of 30 patients each:

1. Group 1 (Case group): In this group, lignocaine was infiltrated in the tracheal lumen and para-tracheal gutter before tracheotomy to block the RLN.
2. Group 2 (Control group): Before tracheotomy, these patients were injected lignocaine in the tracheal lumen only.

Surgical method
All patients had tracheostomy in the operating room under cardio-pulmonary monitoring. The patient lay supine, with the neck cleaned and draped. About 5 ml of 2% lignocaine with adrenaline (1:200 000) was infiltrated around the thyroid region to avoid deep infiltration into the...
Para-tracheal gutter and vessels. The neck was extended with a shoulder bag, and a 2–3 cm long vertical incision (in emergency conditions) was made starting just below the lower border of cricoids or a 2–3 cm horizontal incision (in elective cases) was made about 4–5 cm above the supra-ternal notch. Blunt dissection was performed in the midline, and the trachea was identified. The isthmus of thyroid was retracted upwards with a retractor or divided with electro-cautery, and the pre-tracheal fascia was dissected. Till this stage, surgical steps were similar in both the groups. In the case group, 2% lignocaine with adrenaline (1:200 000) was infiltrated in the tracheal lumen and bilateral para-tracheal gutters to paralyse both RLN. In the control group, 2% lignocaine with adrenaline (1:200 000) was infiltrated in the tracheal lumen only. Within 30 s, the third and fourth tracheal rings were cut and the stoma made. A cuffed non-metallic (silicon) tube was inserted and secured with tape. The cuff was inflated for 1–2 h and then deflated permanently.

A blind observer observed cough reflex and comfort during tracheotomy, tube insertion, and within 2 h (early postoperative period) and after 4 h (late postoperative period) postoperatively. Observations were scored on a visual analogue scale (0 for severe cough and restlessness and 5 for complete cough suppression and comfort). Observations were analysed with the nonparametric Mann–Whitney U-test and P < 0.05 was considered to be statistically significant.

### Results

This case-control study was conducted in 60 patients; these patients were divided into two groups. Both groups had equal number of emergency and elective tracheostomy.

Laryngeal cancer and emergency tracheostomy dominated the control groups. The case group had 27 males and three females with a mean age of 59 years (median age = 56 years). Laryngeal malignancy was present in 22 patients. Twenty patients underwent emergency tracheostomy for acute respiratory obstruction and the other 10 patients had elective tracheostomy for impending airway obstruction.

There were 26 males and four females with a mean age of 59 years (median age = 60 years) in the control group. This group had the same number of emergency and elective tracheostomy as the case group. Laryngeal malignancy was the prime indication for tracheostomy in 26 patients.

The nonparametric Mann–Whitney U-test was used to compare the two groups (Table 1). On statistical analysis, there was a highly significant difference (P < 0.001) between the groups in terms of immediate cough suppression/tracheal irritation during tracheotomy and comfort during the immediate postoperative period. The case group also exhibited a significant difference (0.05%) in the late postoperative period.

The cohort had few complications consisting of minimal haemorrhage (three patients in each group), and surgical emphysema in one patient of group 2 attributed to excessive cough reflex. There was no tube displacement or tube blockage.

### Discussion

Tracheostomy has advanced from an open technique to a percutaneous technique; however, the open technique is still favoured by most otolaryngologists. There is lack of convincing studies to decide the best available technique for tracheostomy. Percutaneous technique is easy, carries less complications and it is cost-effective. However, open tracheostomy is considered equally effective if performed by an experienced surgeon19, and it is considered to be even better than the percutaneous method in terms of outcome8. Pappas et al.1 reviewed the literature on percutaneous and open tracheostomy; however, they could not find a best method of tracheostomy due to a low level of evidence in the published literature.

In spite of the wide popularity of the percutaneous technique, the open technique remains the gold standard option in difficult cases (thyroid tumour, neck mass, neck infection, tracheomalacia, previous extensive neck surgery and tracheostomy, coagulopathy, obese and paediatric patients). Newhouse et al.10 reported that about 96% of otolaryngology programmes in the United States perform open tracheostomy on a regular basis in comparison with 26% of percutaneous tracheostomy.

In the era of highly infectious diseases, we have experienced that there...
is a high risk of infection to the operating team during open tracheostomy. At the time of opening the trachea, cough reflex does not suppress despite infiltrating local anaesthesia in the trachea, and this leads to air droplets infecting the surrounding areas in the operating theatre. This minor but dangerous complication of open tracheostomy led us to conduct this study. We found that bilateral RLN block at the time of tracheal incision caused loss of cough reflex. Lignocaine infiltration in the trachea before tracheotomy can also be a cause of immediate cough, but cough distributes lignocaine in the trachea, leading to cough suppression. However, as stated earlier, it is not 100% effective practically. We found that bilateral RLN block led to significant cough suppression in both groups. This leads to tracheostomy tube insertion comfortably (both to the surgeon and the patient). In the study group, cough reflex was still present in some cases. It is presumed that this may be due to incomplete lignocaine infiltration and early tracheotomy before complete nerve paralysis. Further, these patients had highly significant comfort in the immediate postoperative period due to loss of cough reflex and pain, but this comfort reduced in the late postoperative period due to loss of local anaesthesia.

Lignocaine acts for 2–4 h, and loss of cough reflex leads to comfortable tube insertion in the early postoperative period. Although comfortable surgical procedure will result in fewer complications, we did not assess late complications. Waldron et al. found no significant difference in complications of emergency and elective tracheostomy. Salgarelli et al. conducted a retrospective study in 198 tracheostomies performed by residents under the direct supervision of an experienced surgeon. They reported bleeding in 16.2% cases and pre-tracheal or para-tracheal tube placement in 1.51% cases. Other complications included tracheostomy dehiscence in 2.52% cases and subcutaneous emphysema in 13.12% cases after tracheostomy closure. In our study, there was no complication comparable to the study performed by Salgarelli et al. We had one case in the control group with surgical emphysema immediately after surgery due to excessive cough reflex during tracheotomy. This emphysema subsided within 7 days of the postoperative period. Hypothetically, this complication was avoidable with the bilateral RLN block.

The results of this study are the first of its kind as we did not find other studies in the literature (PubMed, Medline, Scopus, Google Scholar) with similar results. This study contradicts the fear of exacerbation in respiratory obstruction with bilateral RLN block. In our experience, the trachea is identified and secured before lignocaine infiltration and any exacerbation—respiratory obstruction—can be dealt with immediate tracheotomy. We emphasize that the bilateral RLN block before tracheotomy leads to comfortable tube insertion in the early postoperative period, and there is a negligible risk of iatrogenic infection.

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References