

# Keyhole incision and dissection of tissue above trachea in combination with percutaneous Griggs tracheostomy in patients with abnormal coagulation profile and difficult airway: A life-saving hybrid tracheostomy technique

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## ABSTRACT

Tracheostomy is a common requirement in critically ill patients. Many a time, tracheostomy is a lifesaving procedure in critically ill patients with abnormal coagulation profiles or thrombocytopenia, where endotracheal intubation is difficult. Classical surgical tracheostomy has a high risk of bleeding, while the percutaneous technique has a high number of vascular complications and requires a bronchoscope for guiding a percutaneous set needle to puncture the central part of the trachea. Hence, a hybrid technique, keyhole incision and dissection with blunt curved artery forceps up to the pretracheal fascia and Griggs percutaneous technique after direct visualization and palpation of tracheal ring was introduced by Medical intensive care unit team, Department of Medicine, King George's Medical University, Lucknow India for treating critically ill patients where coagulation profile is deranged and bleeding risk is very high with difficult airway. This hybrid technique was done in a 67-year-old patient with a difficult airway and a deranged coagulation profile after taking proper consent. The procedure was performed with minimal bleeding up to 1–2 mL, without any complication, and also prevents further delay in airway management in emergency without the requirement of specialized instruments (like bronchoscopy or any specialized surgical instrument such as retractor and require minimal assistance in emergency).

**Key words:** Blunt dissection, Griggs percutaneous tracheostomy, Hybrid technique, Keyhole incision, Medical intensive care unit

Tracheostomy is a common requirement in critically ill patients. Many a time, tracheostomy is a lifesaving procedure in critically ill patients with abnormal coagulation profiles or thrombocytopenia, where endotracheal intubation is difficult. Classical surgical tracheostomy technique has a high risk of bleeding, and it takes some time for the surgical team to arrive, while the percutaneous technique, which is very popular in the medical intensive care unit (ICU), has a high number of vascular complications and requires a bronchoscope for guiding the percutaneous set needle to puncture the central part of the trachea.

Many hybrid techniques were developed for different indications, such as Mani *et al.* developed a minimal invasive hybrid technique to prevent the shifting of critically ill patients to the operation theatre using surgical dissection up to the trachea using a retractor,

diathermy, and bronchoscope, followed by percutaneous tracheostomy after direct tracheal ring visualization [1]. Similarly, Makowski and Moe developed a hybrid technique by combining the standard surgical technique and the percutaneous technique [2]. A hybrid technique was developed by Tanaka *et al.* during the COVID-19 pandemic to prevent aerosol exposure to medical personnel using a large suction tube to create negative pressure and a surgical arch and surgical field isolation drape [3]. Another hybrid technique, keyhole incision and dissection with blunt curved artery forceps up to the pretracheal fascia and Griggs percutaneous technique after direct visualization and palpation of tracheal ring was introduced by Dr. Amit Anand *et al.* with support of Medical ICU team, Department of Medicine King George's Medical University, Lucknow, India for critically ill patients where coagulation profile is deranged and bleeding risk is very high with difficult airway.

### Access this article online

Received - 04 July 2025  
Initial Review - 23 August 2025  
Accepted - 12 September 2025

### Quick Response code



DOI: 10.32677/ijcr.v11i10.7715

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## CASE PRESENTATION

A 67-year-old man presented in the High Dependency unit in the Department of Medicine, King George's Medical University, Lucknow, with complaints of altered sensorium with right-sided hemiparesis, causing left basal ganglia hemorrhagic stroke with bilateral aspiration pneumonia.

On examination, his blood pressure was 146/82 mmHg, heart rate was 66/min, SPO<sub>2</sub> was 60% with a non-rebreathing mask with oxygen flow of 15 L, and Glasgow coma scale (GCS) was E1V1M1. The chest bilateral coarse inspiratory crepitation was present, and S1S2 were normally heard. Non-contrast computed tomography head (day 1) showing a large left basal ganglia bleed with compression of the left lateral ventricle (Fig. 1).

The patient was immediately shifted on a high flow nasal cannula (HFNC) machine with fio2=100% with a flow of 60 L/min. Even on the HFNC machine, the patient saturation increased up to 80%. Consent for intubation was taken, and intubation was tried but failed. Bag and Mask ventilation was continued. Tracheostomy was planned immediately.

Routine investigation showed a deranged International Normalised Ratio of 3.3, and platelet count was 74,000/mm<sup>3</sup>. The surgical team was informed, but they were asked to arrange blood and blood products. Percutaneous tracheostomy was not tried due to a high risk of bleeding and the non-availability of bedside bronchoscopy. Within 10 min, the patient's hemodynamics changed, and blood pressure dropped to 90/40 mmHg, heart rate was 113/min, and SpO<sub>2</sub> was 78%. Noradrenaline was started immediately, as a lifesaving procedure, and a hybrid technique was planned.

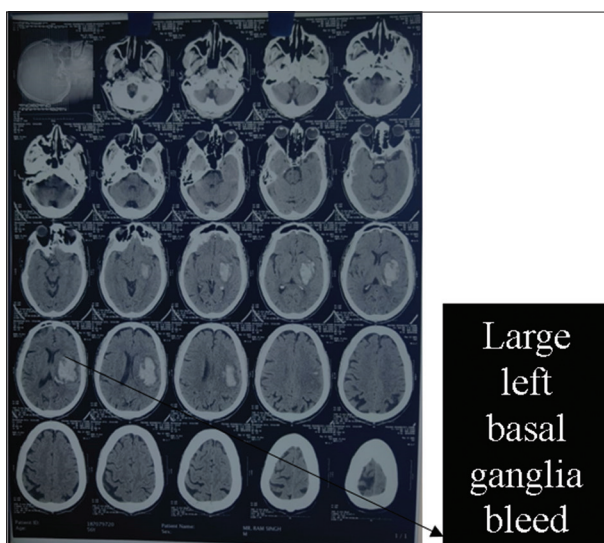
A 0.5 cm transverse incision was given on the skin using an 11 no. surgical blade, which was further enlarged using blunt curved artery forceps. Subcutaneous tissue was held using a blunt curved artery forceps, and

a keyhole incision was made using an 11 no. blade by holding blade at 90° to the tracheal longitudinal plane, and further subcutaneous tissue was dissected using a curved artery forcep. The investing layer of deep cervical fascia was lifted up using artery forceps, and a keyhole incision was made using 11 no blade, holding blade at 90° with tracheal longitudinal plane, it was enlarged. The strap of muscle seen below it was dissected using curved artery forceps. The pretracheal fascia was reached by artery forceps, and a keyhole puncture was given. The fascia was dissected using curved artery and Griggs' forceps, inferior thyroid tributaries were lateralised, and kept away from the puncture site of Griggs' percutaneous needle. The estimated bleed was 1 mL during dissection. Further Griggs percutaneous tracheostomy was performed after direct visualization and palpation of tracheal rings. The procedure was completed in 15 min (Fig. 2).

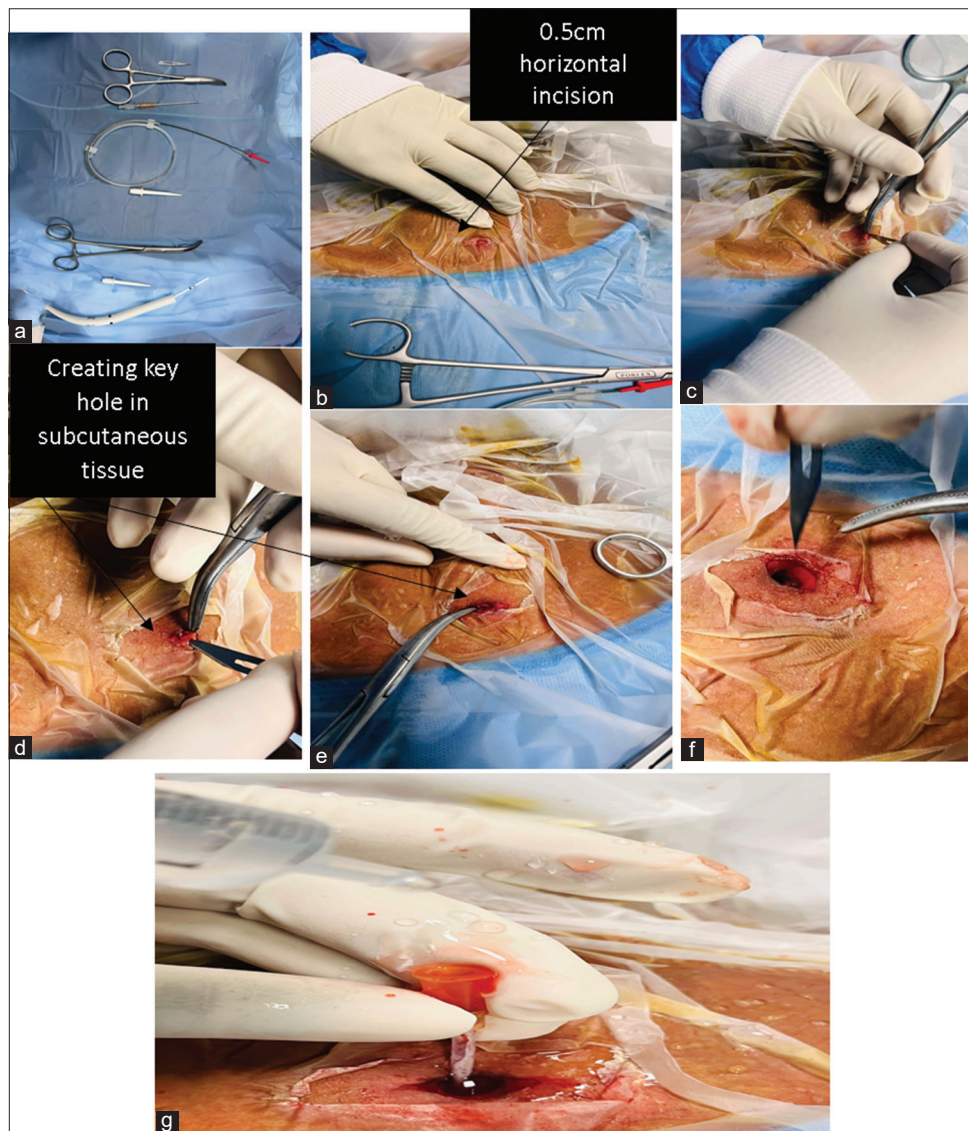
Under fentanyl and Midazolam sedation with minimal bleeding (1–2 mL), the airway was secured. After proper tracheostomy suction and nebulisation, the patient was put on pressure control mode with fio2=100%, positive end-expiratory pressure =10, pressure support of 16, I: E ratio 1:2.5, and respiratory rate of 15/min. After 30 min of ventilation and oxygenation, saturation was improved up to 95%, blood pressure rose to 110/70 mmHg, and heart rate was 86/min. Within 24 h, the patient was weaned from inotropes. After proper antibiotic therapy, proper suctioning of the tracheostomy tube (TT), and chest physiotherapy. Gradually, the patient was weaned from the ventilator after 72 h. Meanwhile, the GCS improved up to E4VTM5 after 7 days. On the 9<sup>th</sup> day, GCS was E4VTM6, and the patient was discharged on day 10 of admission on a TT *in situ*.

## DISCUSSION

Tracheostomy is a lifesaving procedure in patients with difficult intubation, and the procedure becomes even more difficult when there are coagulation abnormalities in the patient along with thrombocytopenia. In this situation, a slight delay in securing the airway can be life-threatening in a medical emergency. It is very difficult to arrange logistics like blood and blood products, surgical instruments, surgical team, bronchoscope, etc., and the decision to go for percutaneous tracheostomy due to the high risk of bleeding is very difficult [4]. Hence, a new hybrid technique, keyhole incision and dissection with blunt curved artery forceps up to pretracheal fascia, and Griggs percutaneous technique after direct visualisation and palpation of tracheal ring, was introduced to minimise bleeding risk and secure the airway in patients with difficult intubation and coagulation abnormalities, even using simple instruments and minimal assistance. After the success of this procedure, this procedure is done on a regular basis in the Medical ICU, King George's Medical University, Lucknow. This technique was



**Figure 1:** Non-contrast computed tomography head (day 1) showing a large left basal ganglia bleed with compression of the left lateral ventricle



**Figure 2:** Steps performed in hybrid tracheostomy before Griggs tracheostomy technique (a) Instruments required (Griggs percutaneous tracheostomy set with blunt curved artery forcep, 11 no blade and white rhino graduated dilator; (b) 0.5 cm skin incision; (c and d) key hole creation subcutaneous tissue and investing layer of deep cervical fascia; (e) Key hole is created in investing layer deep cervical fascia; (f) Dissection of tissue up to pre trachea fascia completed with a curved artery forcep; (g) Further tracheostomy was performed using Griggs percutaneous set after direct palpation of tracheal Ring

later successfully used in 30 patients with a deranged coagulation profile and thrombocytopenia.

Many such hybrid tracheostomy techniques were introduced at different parts of the globe. In 1985, Ciaglia *et al.* described the percutaneous dilatational tracheotomy. This procedure involves making a very small skin incision (1–1.5 cm) and introducing a needle into the trachea through which a J-tipped guide wire is passed. The needle was removed, and a guiding catheter was threaded over the J-wire. A subsequent adequate blunt dilatation of the aperture over the J-wire/guiding catheter unit with a series of eight graduated dilators allows the insertion of a preselected TT tube. This entire procedure requires a step-by-step endoscopic guidance from the beginning to the end and needs a dedicated Kit of instruments for the procedure [5].

Molardi *et al.* in 2016 introduced the Parma tracheostomy technique at Parma University, Italy. In this technique, a 1 cm linear skin incision was given to

reach the trachea by simple separation of the tissue plane without cutting the surrounding structures. However, in this technique, a linear incision on the tracheal ring was given, and the anterior part of the tracheal ring was removed. But in this technique, they used a special silicon probe as a seldinger guide wire [6].

Kang *et al.* in 2021 conducted a retrospective study at Konyang University, Korea, on 55 patients who underwent hybrid tracheostomy using this hybrid technique. The skin was incised at about 1.0–2.0 cm below the cricoid cartilage in the transverse direction. After making the skin incision, the pretracheal tissue was dissected to expose the trachea. After that, tracheostomy was performed using the percutaneous dilatational tracheostomy kit (Ciaglia Blue Rhino Percutaneous Tracheostomy Introducer Kit) after visually checking the exposed trachea. The study on hybrid tracheostomy concluded that hybrid tracheostomy can be safely performed without any serious complications in



most patients [7]. It can also be considered to be a possible treatment for patients taking antiplatelets or anticoagulants without any major complications. It can be a good method in infectious diseases because it can reduce the number of exposed personnel and exposure time.

Advantages of our technique are that it can be performed with using basic surgical instrument (Fig. 2), can be done with minimal assistance, and helps to precise blunt dissection of tissue above the trachea, which leads to minimal blood loss. Direct visualisation of the tracheal ring allows central tracheal puncture without bronchoscopic guidance.

## CONCLUSION

This hybrid technique, keyhole incision and dissection with blunt curved artery forceps up to the pretracheal fascia and Griggs percutaneous technique after direct visualisation and palpation of tracheal ring, can be used in a medical emergency ward as an alternative to percutaneous tracheostomy or surgical technique in medical emergency patients with a difficult airway, along with deranged coagulation profile and with basic surgical instruments.

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*Funding: Nil; Conflicts of interest: Nil.*

**How to cite this article:** Anand A, Reddy DH, Chauhan VK. Keyhole incision and dissection of tissue above trachea in combination with percutaneous Griggs tracheostomy in patients with abnormal coagulation profile and difficult airway: A life-saving hybrid tracheostomy technique. *Indian J Case Reports*. 2025; 11(10):513-516.