

Technique of Harmonic Focus® In Tracheostomy

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Abstract

Objectives: The purpose of the present study was to show the technique of the Harmonic FOCUS® Cured Shears (HF) in tracheostomy in the shortest possible period of time.

Methods: Patients were 10 individuals who had undergone tracheostomy at Tokyo Medical University Hachioji Medical Center. HF was used in the all 10 patients. A skin incision was made in the inferior margin of the cricoid cartilage, and FOCUS® was used from treatment of subcutaneous fat onwards. FOCUS® was used both to dissect the subcutaneous fat, as well as the anterior muscles of the neck and anterior jugular vein, and to seal these parts. The pyramidal lobe of the thyroid gland was transected at a height directly below the cricoid cartilage, and the trachea was reached.

Results: The mean time taken to reach the trachea was 93.1 s (range, 63-115 s).

Conclusions: The HF is useful for tracheostomy and enables an airway to be secured within a short period of time.

Keywords: Harmonic focus; Tracheostomy; Short time; Energy device

Introduction

Securing an airway is of utmost importance in preserving life. Among patients in whom oral intubation is difficult due to upper airway obstruction, an airway must be secured transdermally and as quickly as possible. Cricothyrotomy, which is performed in extreme emergencies, can lead to dysarthria as a result of cricothyroid muscle damage; therefore, regular tracheostomy should be selected when possible. For this reason, tracheostomy is one of the most important procedures in the fields of head and neck surgery and otolaryngology. The established procedure for tracheostomy involves separating the strap muscles in the midline. From our knowledge of anatomy that has been built up over a long period of time, we know that such an approach will minimize hemorrhage from the anterior jugular vein, anterior neck muscles and thyroid [1].

In recent years, rapid advances have been achieved in surgical instruments for this purpose. The Harmonic Scalpel® (HS) (Ethicon Endo-Surgery Inc., Cincinnati, OH) is a new device that has been introduced into surgery during the last decade. It has a blade that vibrates at 55.5 kHz over a distance of 80 µm [2]. It denatures protein through the use of ultrasonic vibration, transferring mechanical energy in amounts that are able to break tertiary hydrogen bonds [3].

The denatured protein subsequently forms a sticky coagulum. The Harmonic FOCUS® Cured Shears (HF) (Ethicon Endo-Surgery), introduced in 2009, represent the latest model of the scalpel. They are similar to the Kelly forceps both in shape and in the way they are manipulated (Figure 1). They are able to seal tissue, including blood vessels, up to 5 mm in diameter, and their shape is well-suited to head and neck surgery. All tissues at the height of the anterior trachea and inferior cricoid cartilage, including fat, anterior muscles of the neck, and pyramidal lobe of the thyroid gland, are dissected and sealed by the HF; therefore, there is no need for concern about sites of anatomical hemorrhage because the trachea may be reached within a short space of time. The purpose of the present study was to show the technique of the HF in tracheostomy with regard to securing an airway in the shortest possible period of time.

Patients and Methods

Patients were 10 individuals who had undergone tracheostomy in the Department of Head and Neck Surgery at Tokyo Medical University Hachioji Medical Center between October 2012 and January 2013. All patients had been previously operated on by the first author (Table 1). HF was used in the all 10 patients. All patients were male, with a mean age of 69.8 years at the time of surgery (range, 59-87 years). Mean Body Mass Index (BMI) was 20.5 (range, 12-28). Underlying pathology was



Figure 1: Upper) Harmonic FOCUS®, Lower) Kelly forceps.

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Case	Age (y)	Sex	Disease	BMI (kg/m ²)	Operation time (s)
1	83	Male	HPC	23	85
2	72	Male	HPC	21	98
3	63	Male	HPC	21	63
4	69	Male	LC	28	115
5	87	Male	HPC	20	95
6	75	Male	LC	22	104
7	63	Male	MSC	17	98
8	66	Male	MPC	22	100
9	59	Male	MPC	19	88
10	61	Male	HPC	12	85

HPC: Hypopharyngeal Cancer; LC: Laryngeal Cancer; MPC: Mesopharyngeal Cancer; MSC: Maxillary Sinus Cancer

Table 1: Patient characteristics and Operation Time.

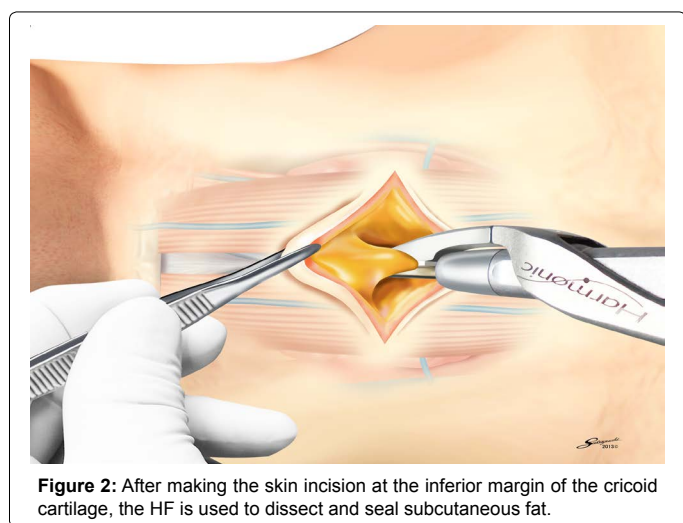


Figure 2: After making the skin incision at the inferior margin of the cricoid cartilage, the HF is used to dissect and seal subcutaneous fat.

hypo pharyngeal cancer in 5 cases, mesopharyngeal cancer in 2 cases, laryngeal cancer in 2 cases and maxillary sinus cancer in 1 case. The procedure was conducted under general anesthesia in 8 patients and under local anesthesia in 2 patients.

A skin incision was made in the inferior margin of the cricoid cartilage, and FOCUS® was used from treatment of subcutaneous fat onwards. FOCUS® was used both to dissect the subcutaneous fat (Figure 2), as well as the anterior muscles of the neck and anterior jugular vein, and to seal these parts (Figure 3). The pyramidal lobe of the thyroid gland was transected (Figure 4) at a height directly below the cricoid cartilage, and the trachea was reached (Figure 5).

The time taken to reach the trachea from making the skin incision was measured. The study was approved by the ethics committee of Tokyo Medical University's Hachioji Medical Center. We have no financial disclosure in this study.

Results

The mean time taken to reach the trachea was 93.1 s (range, 63-115 s) (Table 1). No complications were observed in any patient.

Discussion

HS has been used in laparoscopic surgery and its application expanded to open surgery. HS has been extensively used as an alternative surgical tool for dissection and achieves perfect hemostasis,

particularly in minimally invasive surgery, but the use of HS in open surgery has been limited as the design of the device is uncomfortable for the surgeon [4,5]. However, with a similar form to Kelly forceps, HF is suitable for open surgery, and its usefulness in terms of decreased

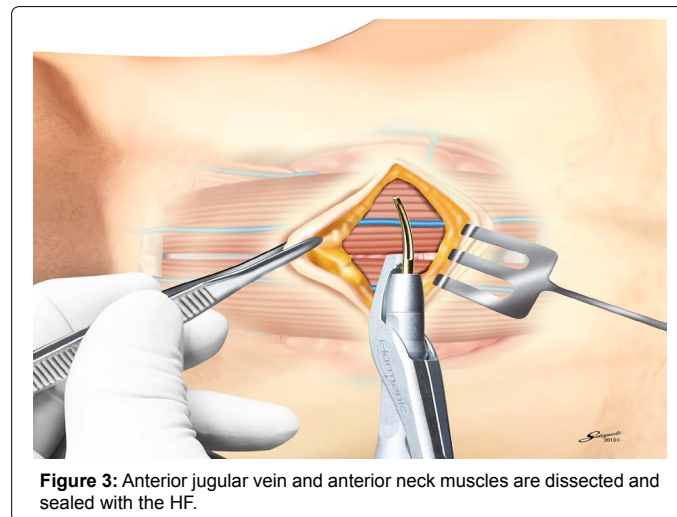


Figure 3: Anterior jugular vein and anterior neck muscles are dissected and sealed with the HF.

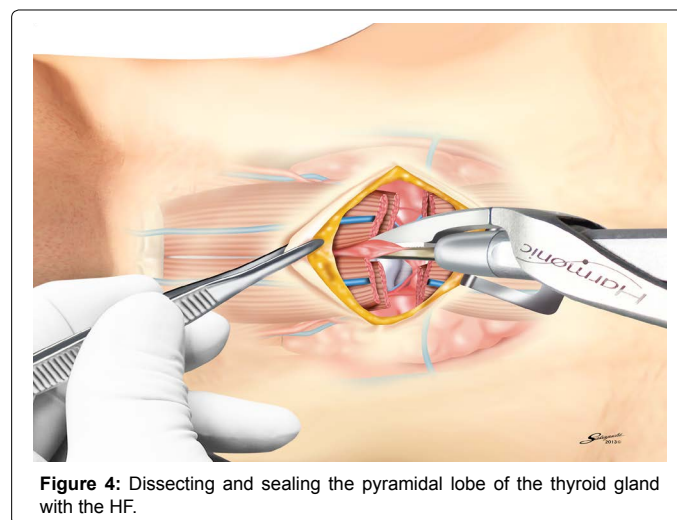


Figure 4: Dissecting and sealing the pyramidal lobe of the thyroid gland with the HF.

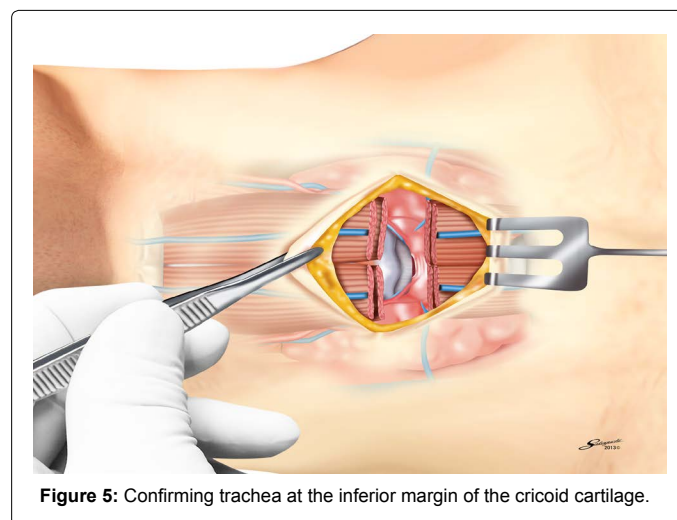


Figure 5: Confirming trachea at the inferior margin of the cricoid cartilage.

hemorrhage and shortened operation time has been widely reported in areas such as thyroidectomy, liver transection, and breast cancer [5-8]. In a randomized study of 200 patients who underwent thyroid operation, Ortega et al. [7] reported a 15-20% reduction in operation time. HF is also suited to tracheostomy. In the current subjects, mean procedure time was 93.1 s. In cases in which the urgency of securing the airway is great, every second of operating time counts. This is therefore an important result.

The tissues at the height of the anterior trachea and inferior cricoid cartilage are fat, the anterior jugular vein, anterior neck muscles and the pyramidal lobe of the thyroid gland. With the use of HF to dissect and seal these tissues, no dysarthria, swallowing defects, or other functional damage will result, and use of the HF for this purpose allows an airway to be secured within a short period of time. However, it is important to confirm the thyroid cartilage and trachea by palpation when using the HF. Resection of the anterior surface of the trachea will usually cause no complications, but a risk of damage to the recurrent laryngeal nerve does exist with blind dissection of paratracheal tissue with the HF. This approach is effective in cases where palpation reveals displacement of the trachea due to lesions such as large thyroid tumor. The present study examined the time to reach the trachea from the inferior margin of the cricoid cartilage, but tracheostomy at any height would be possible by splitting the thyroid with HF. Gohtoda et al. [8] noted that hepatectomy using the HF was performed safely even when the surgeon was a trainee. Based on the present procedure, the HF could be used safely in tracheostomy to secure an airway within a short period of time by large numbers of surgeons.

Conclusion

The HF is useful for tracheostomy and enables an airway to be secured within a short period of time.

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