Effects of surgical and percutaneous tracheotomy on thyroid hormones

Ann Ital Chir, 2019 90, 1: 10-13
pii: S0003469X19028653
Epub Ahead of Print - January 25
free reading: www.annitalchir.com

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AIM: *To evaluate the effects of surgical and percutaneous tracheotomy on thyroid hormones.*
MATERIAL AND METHOD: *Sixty patients with respiratory problems who underwent surgical tracheotomy and percutaneous tracheotomy between December 2012 and December 2016 were divided into 2 groups. FT3, FT4, thyroglobulin and TSH levels of the groups were statistically evaluated preoperatively and postoperatively.*
RESULTS: *The effects of surgical and percutaneous tracheotomy on free thyroxin (FT4), serum thyroglobulin (TG) and thyroid stimulating hormone (TSH) levels were found to be statistically significant. Although free triiodothyronine (FT3) slightly elevated in both groups, it was not statistically significant.*
DISCUSSION: *Today, percutaneous tracheotomy (PCT) and conventional surgical tracheotomy (CT) have been widely used in intensive care units on patients who are expected to be connected to mechanical ventilation for a long time. Because of the anatomy of the surgical site, tracheotomy may cause damage to the adjacent thyroid gland and tracheal rings*
CONCLUSION: *Surgeons should keep in mind that serum thyroid hormone levels may increase postoperatively. Particularly the patients with cardiac rhythm problems should be followed after surgical and percutaneous tracheotomy due to the systemic effects of thyroid hormones.*

KEY WORDS: Tracheotomy, Thyroid hormones

Introduction

Tracheotomy is to provide a new airway to the trachea through a hole opened in the neck. It is one of the life-saving emergency operations commonly used in the head and neck surgery [1-4]. This procedure has been practiced for more than 3000 years. In early reports, airway obstruction was reported to be the indication for tracheotomy. It was also reported to be very dangerous and to have high mortality rate [2,3]. Indications for tracheotomy are upper airway obstruction, mechanical respiratory failure, respiratory difficulty due to secretion and long-term intubation [3,5]. Today, percutaneous tracheotomy (PCT) and conventional surgical tracheotomy (CT) have been widely used in intensive care units on patients who are expected to be connected to mechanical ventilation for a long time (10 days). When compared with the surgical tracheotomy, PCT is simple, can be performed in a short time and has low complication rate [1,2,4]. However, although it is easy and can be performed in a short time, some studies have reported that the incidence of perioperative complications and mortality increases when it is performed by inexperienced staff. In the literature, there are studies explaining the surgical procedures [6,7].
Because of the anatomy of the surgical site, tracheotomy may cause damage to the adjacent thyroid gland and tracheal rings. The resulting surgical stress can lead to an increase in FT3 and FT4, to cardiac arrhythmias, and even to a thyroid crisis [8,9].

Pervenuto in Redazione Marzo 2018. Accettato per la pubblicazione Aprile 2018
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Material and Method

The study was carried out at Mustafa Kemal University by the clinics of otorhinolaryngology and thoracic surgery between December 2012 and November 2016. Sixty patients who underwent tracheotomy were evaluated in the study. Thirty patients underwent CT and the other thirty underwent PCT. Informed patient consents and Ethics committee approval (MKÜ 2014-89) were received. Patients with short neck, face and neck trauma, kyphosis or scoliosis underwent PCT, and patients not having such pathologies underwent CT. Thyroid isthmus was not removed in CT. FT3, FT4, thyroglobulin and TSH hormone levels of the groups were recorded preoperatively and at the postoperative 1st and 3rd hours and on the 7th day, and the impact of the surgery on them was studied. The results of both groups were statistically evaluated by using Paired-Samples "t" test.

Results

Thirty-two patients were male and twenty-eight were female. The mean age was 55 (30-80) years. There was no statistically significant difference between the two groups in terms of age and gender (p> 0, 05). Preoperative and postoperative 1st, 3rd hours and 7th day FT3 levels of the groups are given in Fig. 1, FT4 levels in Fig. 2, thyroglobulin levels in Fig. 3, and TSH levels in Fig. 4 When compared to the PCT Group, FT3 tended to increase at the postoperative 1st and 3rd hours in CT Group, but it was not considered statistically significant (Table I).When compared to the PCT Group, FT4 increased at the postoperative 1st and 3rd hours in CT Group. This increase was statistically significant (p <0,023) (Table II).
TG values of CT group tended to increase more than those of PCT Group at the 1st hour, but at the 3rd hour

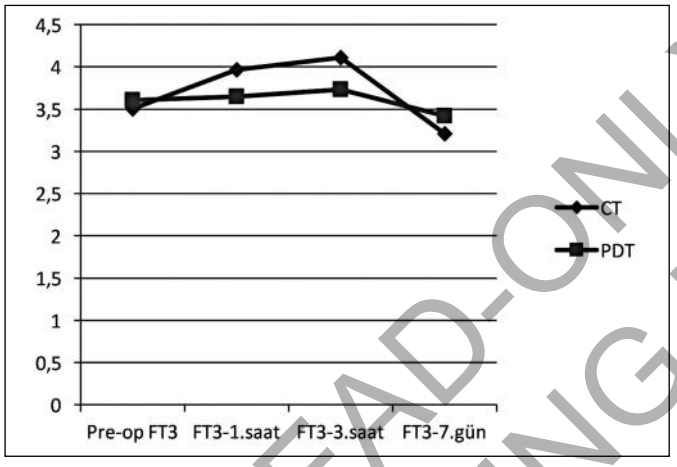

Fig. 1: FT3 values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on7th day.

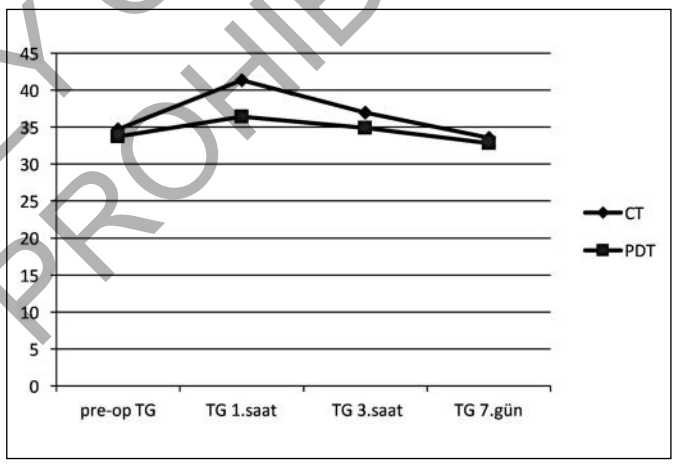

Fig. 3: TG values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on7th day.

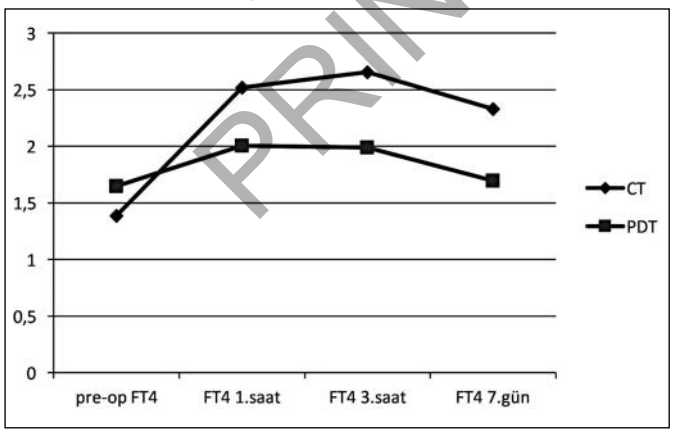

Fig. 2: FT4 values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on7th day.

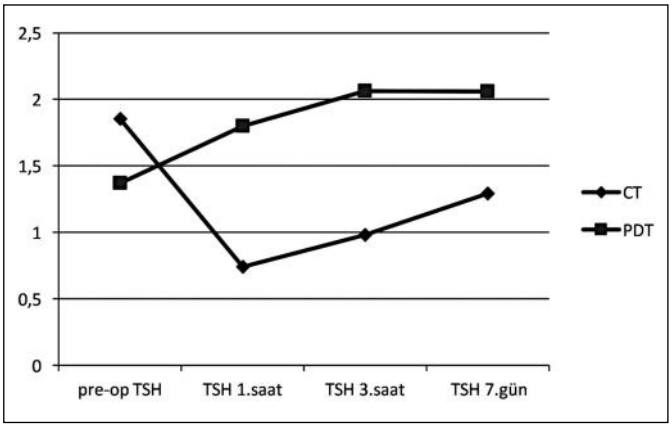

Fig. 4: TSH values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on7th day.

Table I - *FT3 values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and 7th day*

	Group 1	Group 2	P value
FT3-preoperative	3.50 ± 0.63	3.60 ± 0.74	0.0579
FT3- 1st hour	3.96 ± 1.48	3.65 ± 1.08	0.35
FT3- 3rd hour	4.11 ± 1.48	3.73± 1.07	0.26
FT3- 7th day	3.21 ± 0.99	3.42 ± 0.84	0.382

Table II - *FT4 values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on the7th day*

	Group 1	Group 2	P value
FT4-preoperative	1.38 ± 0.45	1.64 ± 0.32	0.013
FT4- 1st hour	2.52 ± 1.25	2.00 ± 0.80	0.63
FT4- 3rd hour	2.65 ± 1.32	1.99± 0.81	0.23
FT4- 7.th day	2.33 ± 1.48	1.69 ± 0.45	0.30

Table III - *TG values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on the 7th day*

	Group 1	Group 2	P value
TG- preoperative	34.73 ± 2.06	33.70 ± 1.23	0.022
TG- 1st hour	41.33 ± 9.73	36.40 ± 5.20	0.17
TG- 3rd hour	36.90 ± 8.22	34.90± 3.63	0.21
TG- 7th day	33.56 ± 5.66	32.83 ± 0.83	0.486

Table IV - *TSH values of CT and PCT groups preoperatively and at postoperative 1st and 3rd hours and on the7th day*

	Group 1	Group 2	P value
TSH- preoperative	1.85 ± 1.02	1.37 ± 0.30	0.016
TSH- 1st hour	0.73 ± 1.12	1.79 ± 1.22	0.01
TSH- 3rd hour	0.97 ± 1.24	2.06± 0.92	0.0001
TSH- 7th day	1.29 ± 1.35	2.06 ± 0.89	0.12

and on the 7th day, the level tended to decrease in both groups. These values were considered statistically significant (p< 0,017) (Table III).

TSH values of CT Group were significantly lower than those of PCT Group, preoperatively and particularly at the postoperative 1st hour. These values were statistically significant (p <0.01) (Table IV).

Discussion

Today, percutaneous tracheotomy (PCT) and conventional surgical tracheotomy (CT) have been widely used in intensive care units on patients who are expected to be connected to mechanical ventilation for a long time. Although it has advantages, tracheotomy is an invasive procedure, and various complications can develop. In recent years, PCT, which is performed as a bedside procedure for shorter periods, has been preferred for critically ill patients due to its low complication rate and has been safely used as an alternative to CT (2). In some studies, it has been reported that PCT has lower early and late complication rates than CT. However, its performance by inexperienced staff can lead to serious complications.

Since they are close to the thyroid gland, surgical procedures performed in the neck region may cause stress, and this stress can lead to an increase in the amounts of FT3 and FT4 hormones. Thyroid hormone changes due to surgical interventions may lead to a series of clinics ranging from cardiac arrhythmias to thyroid crisis. Possible causes of thyroid crisis are palpitation, a damage or trauma to the thyroid gland, a history of thyroid surgery, iodine treatment, or infection. In 2001, Michaaki et al. reported that in operations performed for cholecystectomy and morbid obesity, the levels of TSH, FT3 and FT4 started to increase at the postoperative 30th minute and reached to the statistically significant level at the 1st hour [3,5,9]. In another study, thyroid hormones and thyroglobulin levels were measured before and after thyroid fine needle aspiration biopsy, and an increase in T3 and T4 levels was observed, but this increase was not considered statistically significant [10]. In our study, FT3 tended to increase at the postoperative 1st and 3rd hours in CT Group when compared to the PCT Group, but it was not considered statistically significant. FT4 levels at the 1st and 3rd hours were also higher in CT Group than PCT Group, and this increase was considered statistically significant (p <0.023).

Compared to the literature, thyroglobulin levels at the postoperative 1st and 3rd hours increased more in CT Group than it did in PCT Group [9,10]. Similarly, TG values at the 1st hour tended to increase more in CT Group. However, they tended to decrease at the 3rd hour and on the 7th day in both groups. These values were considered statistically significant (p <0.017).

Preoperative TSH values and particularly the TSH values at the postoperative 1st hour were significantly low in CT Group than those in PCT Group. These values were considered statistically significant (p <0.01).

Tracheotomy is a life-saving procedure, but because the performance area is very close to the thyroid gland, it affects the thyroid gland with deep palpation and causes an increase in hormone levels. Since it provides a balance among endocrine, circulation, metabolism, heart and rhythm, it can cause disorders in these systems. A study conducted on pigs with hyperthyroidism revealed that an increase in the heart beat rate with the direct impact of thyroid hormones increases the sympathetic stimulation and causes contractility. It elevates the myosin enzyme in the heart [9,10].

Thyroid hormones activate the Na + 2 pump in the heart and other tissues, and this, in turn, can increase catecholamine sensitivity and beta adrenergic receptors. An increase in the heart beat rate and dilation with peripheral arteries can occur due to myocardial inotropic effect. Postoperatively increased thyroid hormones, particularly in CT patients, have an impact on basal metabolism, endocrine, heart and circulatory system. These undesirable effects create serious problems particularly in cardiac patients with arrhythmic disorders. Thus, the complications that may occur in the postoperative period should be taken into consideration, and the cardiac rhythms of the patients should be monitored during this period.

Conclusion

Surgeons should keep in mind that serum thyroid hormone levels may increase postoperatively. Particularly the patients with cardiac rhythm problems should be followed after surgical and percutaneous tracheotomy due to the systemic effects of thyroid hormones.

Riassunto

Lo srudio si è proposto di valutare gli effetti della tracheotomia chirurgica e percutanea sul livello degli ormoni tiroidei su 60 pazienti con problemi respiratori e pertanto trattati con tracheotomia chirurgica e percutanea tra Dicembre 2012 e Dicembre 2016, dividendo i pazienti in due gruppi di 30 ciascuno. In ciascun gruppo sono stati valutati statisticamente i livelli di FT3, FT4, TG e TSH pre- e postoperatoriamente.
Gli effetti della trcheotomia chirurgica e percutanea suI tassi di FT4, TG e TSH sono stati statisticamente significativi, a differenza dei tassi non significativi di FT3 – lievemente elevati in entrambi i gruppi.
Attualmente la tracheotomia percutanea (PCT) e la tracheotomia convenzionale chirurgica (CT) sono largamente impiegate nelle Unità di terapia intensiva su pazienti destinati ad essere connessi con i respiratori meccanici per un periodo prolungato. Questi atti chirurgici possono creare danni alla ghiandola tiroide adiacente ed agli anelli tracheali su base anatomica, ed i chirurghi devono tenere presente che il livello degli ormoni tiroidei possono aumentare nel postoperatorio. n particolare i pazienti con problemi del ritmo cardiaco devono essere seguiti nel postoperatorio della tracheotomia per gli effetti sistemici degli ormoni tioridei.

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