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Original Article

Effect of the Trendelenburg position on the homeostasis during and post thyroidectomy

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Abstract

Introduction: Thyroidectomy is one of the most common surgeries that can be accompanied by postoperative hematoma. The present study aimed to evaluate the impact of the Trendelenburg position on the homeostasis of the surgery site during and after thyroidectomy.

Methods: This clinical trial was performed on 60 euthyroid patients in the age range of 18-70 years within 2019-2021. Patients were randomly assigned to the two groups of routine surgery and Trendelenburg using a table of random numbers. The primary outcome was the number of bleeding points immediately after the Trendelenburg position, and secondary outcomes included demographics, final pathology, postoperative hematoma, duration of operation, rate of fluid and seroma accumulation, and patient satisfaction. Data were analyzed in SPSS software (version 19) using Mann Whitney, Chi-square, and Fisher's exact test. The significance level was set to 5%.

Results: The mean age of the patients was 40±13 years, and the majority of them (n=48) were female. The mean number of bleeding points identified intraoperatively was significantly higher in the Trendelenburg group, as compared to that in the routine surgery group (8.7±3.8 vs 5.4±1.8; P<0.001). In the Trendelenburg group, the mean scores of intra-operative blood loss and duration of operation were obtained at 6.4±1.8 g and 118.0±32.0 min, respectively.

Conclusion: As evidenced by the obtained results, the Trendelenburg position significantly increased the number of bleeding points in patients undergoing thyroidectomy; nonetheless, it had no effect on the amount of bleeding and operation duration.

Keywords: Thyroidectomy, Position, Trendelenburg

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Introduction

The thyroid as one of the largest endocrine glands is a very vascular organ which is highly prone to endocrine diseases, and surgery is often the treatment of choice (1). Over the last century, thyroidectomy which was once a dangerous surgery evolved into a safe procedure with acceptable results (2). This operation is performed for a variety of thyroid diseases, including thyroid nodules, hyperthyroidism, and goiter, as well as a wide range of thyroid cancers (2). Among these, the multidisciplinary management of patients with thyroid disease requires best care provision (1). Postoperative bleeding is one of the critical and troublesome complications after thyroid surgeries, sometimes causing substantial morbidity and mortality (3-6).

In this regard, post-thyroidectomy neck hematoma is a matter of concern for surgeons since it can lead to severe and life-threatening complications (7). In fact, bleeding during thyroidectomy causes serious damages to the laryngeal nerve and parathyroid glands. Finally, accurate homeostasis is of utmost importance in the prevention of postoperative hematoma (5); moreover, it is highly important in all surgical procedures. Nevertheless, the head and neck are particularly sensitive to bleeding due to high vascularity in these areas and are prone to hematoma formation which leads to severe consequences (8), such as airway obstruction, respiratory distress, or even death from suffocation (5, 9).

Various methods have been used to optimize intraoperative homeostasis; nonetheless, they have not been well established (8, 10). Trendelenburg position, Valsalva maneuver, and abdominal pressure as some methods used for the control of homeostasis lead to increased venous pressure (11). The Trendelenburg position is also useful for the prevention of post-thyroidectomy bleeding on homeostasis during surgery (12). It is also needed to prevent and control postoperative bleeding (6). In light of the aforementioned issues, the present study aimed to assess the effect of placing the patient in the Trendelenburg position on the reduction of postoperative bleeding.

Materials and Methods

This double-blinded clinical trial incorporated 60 patients within the age range of 18-70 years who were candidates for elective thyroidectomy in Ali-ibn Abitalib Hospital in Zahedan, Iran(2019-2021). Patients and data analyzers were blinded to the studied groups. All patients were given a brief explanation of the research project and signed the informed consent form to participate in the study (IR.ZAUMS.REC.1398.141). The study protocol was registered on the Iranian Registry of Clinical Trials website (code: IRCT20190502043447N1). The exclusion criteria were as follows: diabetes or other underlying diseases, a history of neck surgery, use of anticoagulants 48 h before the surgery, long-term use of analgesics, addiction, sensitivity to anesthetics, and history of coagulation problems. The patients were assigned to two groups of routine surgery and Trendelenburg using a table of random numbers designed in the Microsoft Excel software. Prior to the operation, patients examined certain pre-operative testing to surgery preparation. All patients underwent general anesthesia and were operated on by or under the supervision of the same surgeon using the same surgery protocol.

The routine surgery for thyroid nodules involves lobectomy or total thyroidectomy (depending on preoperative diagnostic tests), as well as intraoperative exploration and frozen section. Both lobes and isthmus were carefully examined. The routine methods of clamping, tying arteries, and bipolar diathermy were employed to control bleeding. In the routine control group (n=30), the head of bed was tilted 30 degrees postoperatively. In the Trendelenburg group (n=30), the head of bed was lowered to 30 degrees for 2-8 min (median,4), the bleeding vessels were checked, and finally, the anesthesia team was requested to increase the blood pressure. The Trendelenburg position was applied immediately after the surgery. Hemostasis and possible bleeding were checked again and immediately treated. All cases of bleeding and treatment were recorded in a chart. Bleeding

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was monitored and recorded immediately after thyroidectomy until the wound was closed.

The primary outcome was the number of bleeding points immediately after the Trendelenburg position, and secondary outcomes included demographics, final pathology, postoperative hematoma, and duration of operation, rate of fluid and seroma accumulation, and patient satisfaction. The outcomes were measured by one surgeon; moreover, patient satisfaction was evaluated using a two-point scale and collected anonymously by an independent researcher. The amount of intra-operative blood loss was measured by the calculation of weight differences of gauzes before and after use in surgery and their addition to the total weight of blood aspirated in the suction bottle. Data were analyzed in SPSS software (version 19). Normality was performed by the Shapiro Wilks test. The demographic and surgical information of patients in the routine surgery and Trendelenburg groups were compared using the Mann-Whitney test. Chi-square or Fisher's exact tests were utilized to compare the frequency distribution in the groups. The significance level was set to 5%.

Results

The present study was conducted on 60 patients with a mean age of 40.0±13.0 years (minimum and maximum of 18 and 70 years). There were 24 (80%) women in the Trendelenburg surgical group. The preoperative mean scores of systolic blood pressure and heart rate were similar in the Trendelenburg and Routine surgery groups. No significant difference was detected between the two groups in terms of demographic characteristics (P>0.05; Table 1). In the Trendelenburg group, 18 (60%) and 8 (27%) patients had papillary carcinoma (PTC) and follicular neoplasm, respectively. In the surgical group, 17 (57%) and 4 (13%) patients had PTC and goiter, respectively. The results of Fisher's exact test revealed no significant difference between the two groups in pathology. (P=0.38: Figure 1).

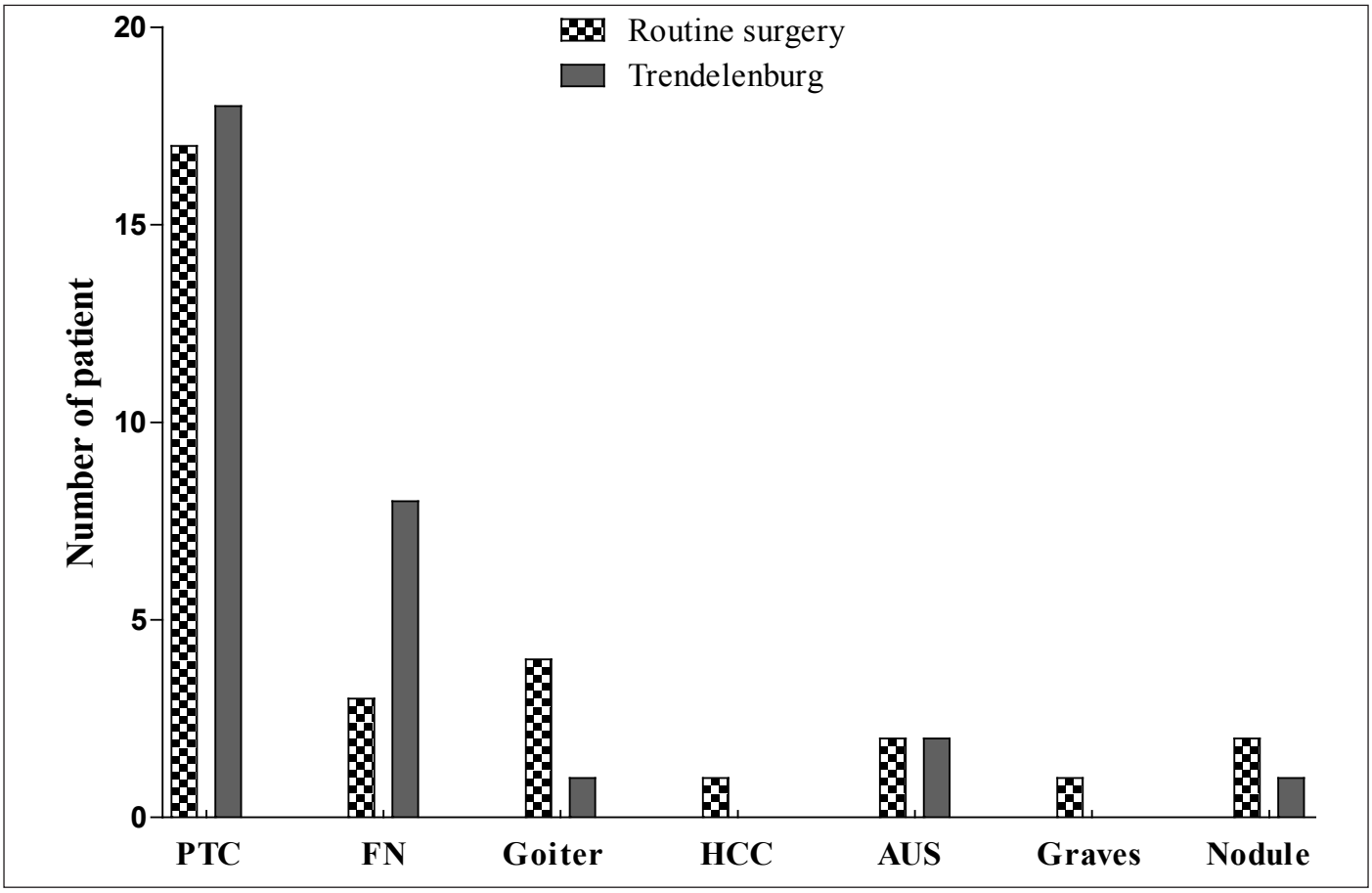


Figure 1. Frequency distribution of various pathology of the patient in routine surgery and Trendelenburg groups; PTC: Papillary Thyroid Carcinoma, FN: Follicular neoplasm, HCC: Hartle cell carcinoma, AUS: Atypia of Undetermined Significance; The data were compared with Fisher's exact; P=0.38.

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The mean number of bleeding points identified intraoperatively in the Trendelenburg group was significantly higher, as compared to that in the routine surgery group (8.7±3.8 vs 5.4±1.8; P<0.001). In the Trendelenburg group, the mean scores of intra-operative blood loss and duration of operation were obtained at 6.4±1.8 g and 118.0±32.0 min, respectively.

The results of the Mann-Whitney test indicated that the mean scores of intraoperative blood loss and duration of operation were not significantly different between the two groups (P> 0.05: Figure 2 a:c). In the routine surgery group, 3 (10.0%) patients were dissatisfied, while in the Trendelenburg group, 1 (3.0%) patient was dissatisfied. No patients in the Trendelenburg group had postoperative hematoma or seroma accumulation (Table 2); however, patients in the routine surgical group had experienced postoperative complications, including hematoma (n=3) and seroma accumulation (n=3). The test results demonstrated that the level of patient satisfaction, as well as the frequency of fluid and seroma accumulation or hematoma formation, was not significantly different between the two groups (P> 0.05; Table 2).

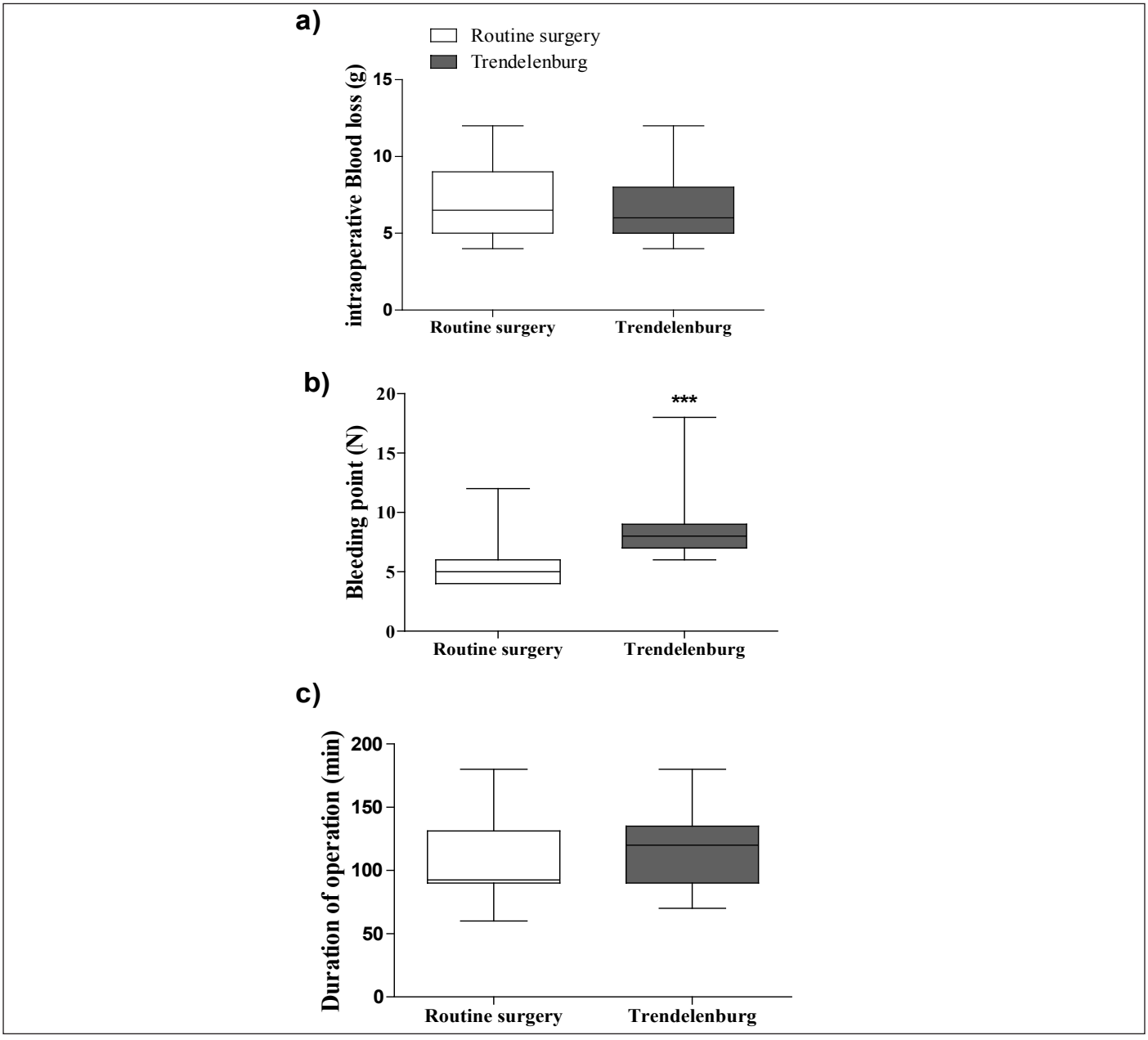


Figure 2. Comparison of surgical information of patients in routine surgery and Trendelenburg groups; ***p<0.001 versus routine surgery group; Data were displayed as median [max; min].

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Table 1. Comparison of demographic characteristics of patients in routine surgery and Trendelenburg groups.

	All patients	Routine group	Trendelenburg group	Test result
Age range (years) (mean) †	39.5±12.5	39.0 ± 14.0	40.0 ± 11.0	P=0.71
Gender #				P=0.63
Male	12	6.0 (20.0)	6.0 (20.0)	
Female	48	24.0 (80.0)	24.0 (80.0)	
Systolic blood pressure (mmHg) †		118.0 ± 10.0	119.0 ± 9.0	P=0.74
Heart beat (bpm.) †		81.0 ± 10.0	82.0 ± 9.0	P=0.68

†: mean ± standard deviation; #: frequency (percent), bpm; beat per minute

Table 2. Comparison of frequency of patient's satisfaction and post-operative seroma in routine surgery and Trendelenburg groups

Variable	Routine surgery N(%)	Trendelenburg N(%)	Test result
Postoperative hematoma	3.0 (10)	0.0 (0)	P=0.23
Patient satisfaction			P=0.31
Satisfied	27.0 (90.0)	29.0 (97.0)	
Dissatisfied	3.0 (10.0)	1.0 (3.0)	
Accumulation of seroma	3.0 (10)	0.0 (0)	P= 0.23

Discussion

There is no study on the effect of the Trendelenburg position on homeostasis after thyroidectomy in Iranian population, and this is the first study performed in this context. In the present study, it was found that the Trendelenburg position during surgery provides a chance to identify bleeding points. The obtained results pointed out that the mean number of bleeding points in the Trendelenburg group was significantly higher, as compared to that in the surgical group. Furthermore, in the Trendelenburg group, the mean scores of intra-operative blood loss and duration of operation were different from those of the routine surgical group; however, the difference was not statistically significant. Another important result was a reduction in the complication of thyroidectomy.

This result is somewhat consistent with those obtained by Tokaç et al. (2015). In the mentioned study, the use of the Valsalva maneuver did not significantly prolong the operation time but allowed the surgery team to identify possible bleeding points in 32% of cases. Tokaç et al. also reported that the two groups did not significantly differ in thyroid gland size, duration of operation, hospital stay, and duration of the drain. The amount of drainage, as well as the frequency of hematoma, reoperation, and further complications, was not significantly different between the studied groups (13). Postoperative bleeding is potentially life-threatening in thyroid surgery. Early detection and immediate intervention are prerequisites to the successful management of this serious problem; moreover, the detection of possible bleeding points during surgery is very critical (11).

In the same context, Moumoulidis et al. (2010) concluded that the Trendelenburg position is more effective than the Valsalva maneuver in the identification of bleeding vessels at hemostasis without any intracranial complications (8). In addition, Ozdemir et al. (2017) stated that the Valsalva maneuver helps detect more bleeding points after the Trendelenburg position (11), and therefore, reduces bleeding. Some studies have suggested that the Trendelenburg position is

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sensitive to the identification of bleeding vessels and is involved in bleeding control (8, 14, 15). However, a longer duration of this position may limit the procedure due to the risk of high intracranial pressure (11, 15). Therefore, in the present study, the Trendelenburg position of 30 degrees was used for 4 min.

Yüksel et al. (2020) examined the effect of different degrees of head-of-bed elevation after thyroidectomy on respiratory pattern and drainage. Patients were allocated to three matching groups: supine, 30-degree head-of-bed elevation, and 45-degree head-of-bed elevation. They reported no hematoma in any of the patients, and head-of-bed elevations to varying degrees had no significant impact on respiratory rate and drainage during the first four hours after thyroidectomy (16).

This discrepancy between the results of the present research and those reported by Yüksel et al. can be attributed to the different purposes of the two studies.

Another finding of this study was the reported dissatisfaction in 3 (10%) patients in the routine surgical group and 1 (3%) patient in the Trendelenburg group; however, the rates are not significantly different. Nevertheless, it should be acknowledged that satisfaction is a multifaceted concept which can be affected by patient expectations, patient status and healthcare conditions, age, access, comfort, response capacity, specialist competence, and surgeon's skills (17).

The type of surgery in these two studies differs from that of the present research (18,19), and patient satisfaction was higher in the Trendelenburg group, as compared to that in the routine surgery group.

Moreover, in both studies, the Trendelenburg position led to reduced complications and increased patient satisfaction. Seroma, as the build-up of fluid at the surgical site, is a common complication of surgery typically occurring in the early postoperative period with an incidence rate of up to 37.9% (20).

In the present study, it was found that all the 30 patients in the Trendelenburg group were without fluid and seroma accumulation.

However, the frequency of fluid accumulation and seroma were not significantly different between the two groups. The results of the current study are consistent with those obtained by Manouras et al. (21) and Qandili et al. (22). In these studies, the Trendelenburg position had no significant effect on the amount of seroma (23). Based on the findings of the study by Qandili et al. and a meta-analysis (22), the post-surgical drainage in thyroidectomy did not offer any significant advantage on seroma. Arowolo et al. (24) reported two cases of seroma in 30 patients undergoing surgery. However, in the stated study, the head of bed was tilted upwards to 15 degrees in an opposite direction from the Trendelenburg position; moreover, thyroidectomy was performed using the ligation technique.

Every study has some limitations which need to be addressed in the paper. Firstly, blinding was not possible to achieve. Another limitation is the fact that patients were not evaluated for long-term postoperative complications. The lack of a validated patient satisfaction assessment tool was the third notable limitation. It is recommended that future studies be conducted with larger sample sizes and assess long-term complications.

Conclusion

As evidenced by the obtained results, the Trendelenburg position significantly increased the number of bleeding points in patients undergoing thyroidectomy; nonetheless, it had no effect on the amount of bleeding and operation duration.

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Conflicts of Interest

There is no conflict of interest.

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